

44689051

 CONTROL DATA

LINEWRITER 400/800
MODELS CT301-A/B/C/D/E AND CT302-A/B/C/D/E

INTRODUCTION
MAJOR PRINTER ASSEMBLIES
PRINTER OPERATION AND OPERATING
PROCEDURES
INPUT POWER BOARD - AC/DC DISTRIBUTION
PERSONALITY MODULES
CPU AND PRINT HEAD ELECTRONICS BOARD
VERTICAL AND HORIZONTAL SYSTEM
BAND AND RIBBON SYSTEMS
HAMMER DRIVER BOARD AND HAMMER
MODULE ASSEMBLIES
FAULT ISOLATION AND SYSTEMS SAFETY
LOGIC DIAGRAMS - PRINTER
LOGIC DIAGRAMS - I/O ADAPTORS
LOGIC DIAGRAMS - PERSONALITY MODULES

TECHNICAL MANUAL

REVISION RECORD

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Revision Procedure:

The revision record page is revised for each revision package to reflect the revision sequence: (Pre-Release) Rev. 01,02 etc, (Release) Rev. A, Rev. B, Rev. C, etc. The revision record page also provides a brief description of each change. A manual update revision package will be available for manuals after the Release revision of the manual. Each page revised in an update revision package will have the month and year printed in the lower right hand corner. This same date would appear in the revision column above, just below the revision identification. An Instruction Sheet cover is with each revision package, explaining page removal and insertion and reason for the change. The instruction sheets for revision packages are then to be placed at the back of the manual as a record of the change.

IDENTIFICATION NO.

PREFACE

This manual contains technical information for the Linewriter 400/800 printers.

The publications listed below are related publications for these printers.

PUBLICATION	PUBLICATION NUMBER
Set-Up and Reference Manual (With OEM Parallel Interface)	44689053
Set-Up and Reference Manual (With RS-232 Serial Interface)	44689037
Set-Up and Reference Manual (With Centronics Parallel Interface)	44689059
Maintenance Manual	44689032
Parts Identification Manual	44689062

WARNING This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A peripheral computing device pursuant to Subpart J of Part 15 of the FCC Rules which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

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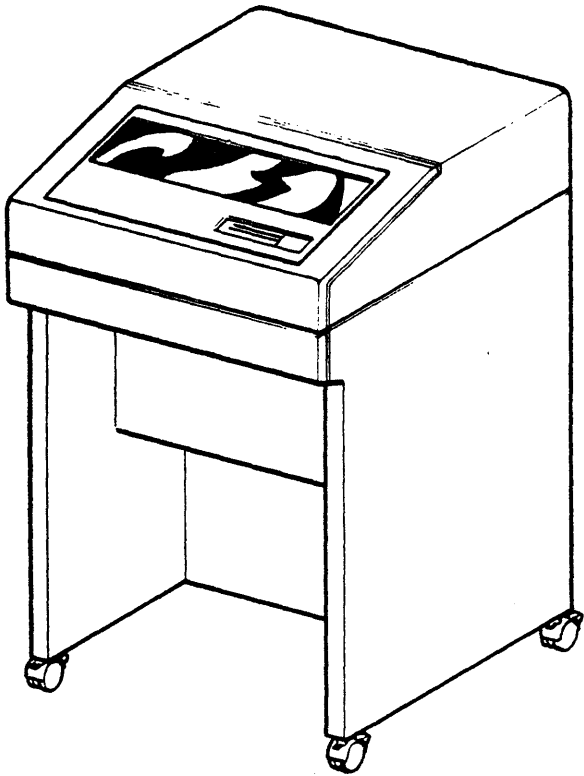
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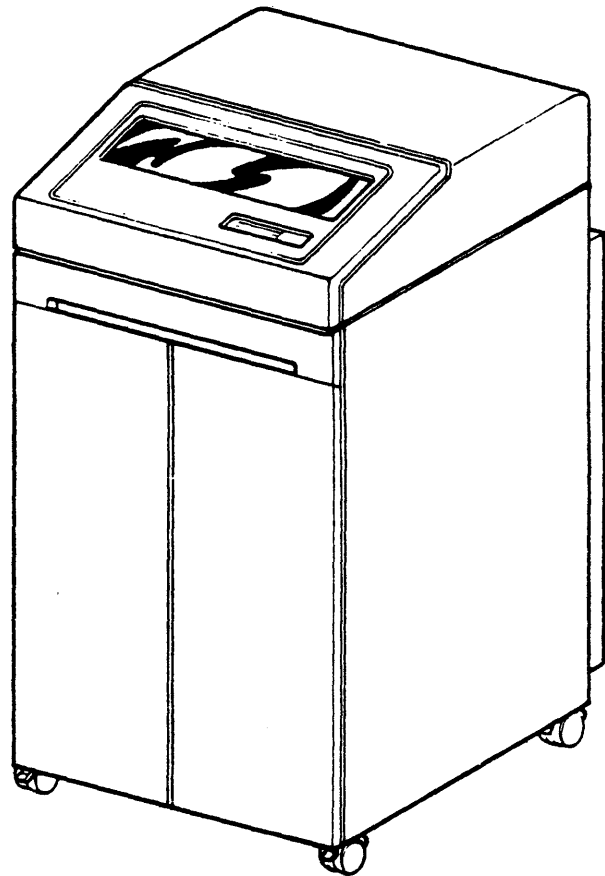
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WITHOUT DOORS



WITH DOORS

LINEWRITER 400/800

SECTION I INTRODUCTION

These printers were designed to be serviced by the customer engineer with a minimum amount of time and effort. All assemblies and their components are easily accessed for removal, replacement and adjustment. There are very few mechanical adjustments and no electrical adjustments. The mean time to repair (MTTR) is 0.5 hour.

The 800 LPM printer is functionally the same as the 400 LPM printer except the hammer bar does not shift in the 800 LPM model. This makes it necessary for twice as many hammers in the 800 LPM units.

The printer's documentation consists of five manuals:

1. Operator Cards; located in the printer's band cover (beneath the bonnet).
2. Set - Up and Reference Manual; documents installation and checkout, factory switch settings, choosing a location, input power conversions, and interface signals.
3. Maintenance Manual; documents spare parts identification, fault isolation, replacement procedures and adjustment procedures.
4. Parts Identification Manual; identifies every assembly in the printer by description and part number.
5. Technical Manual; This manual documents the principles of operation and logic schematics.

SECTION II MAJOR PRINTER ASSEMBLIES

This section contains information on major printer assemblies identification and their functions.

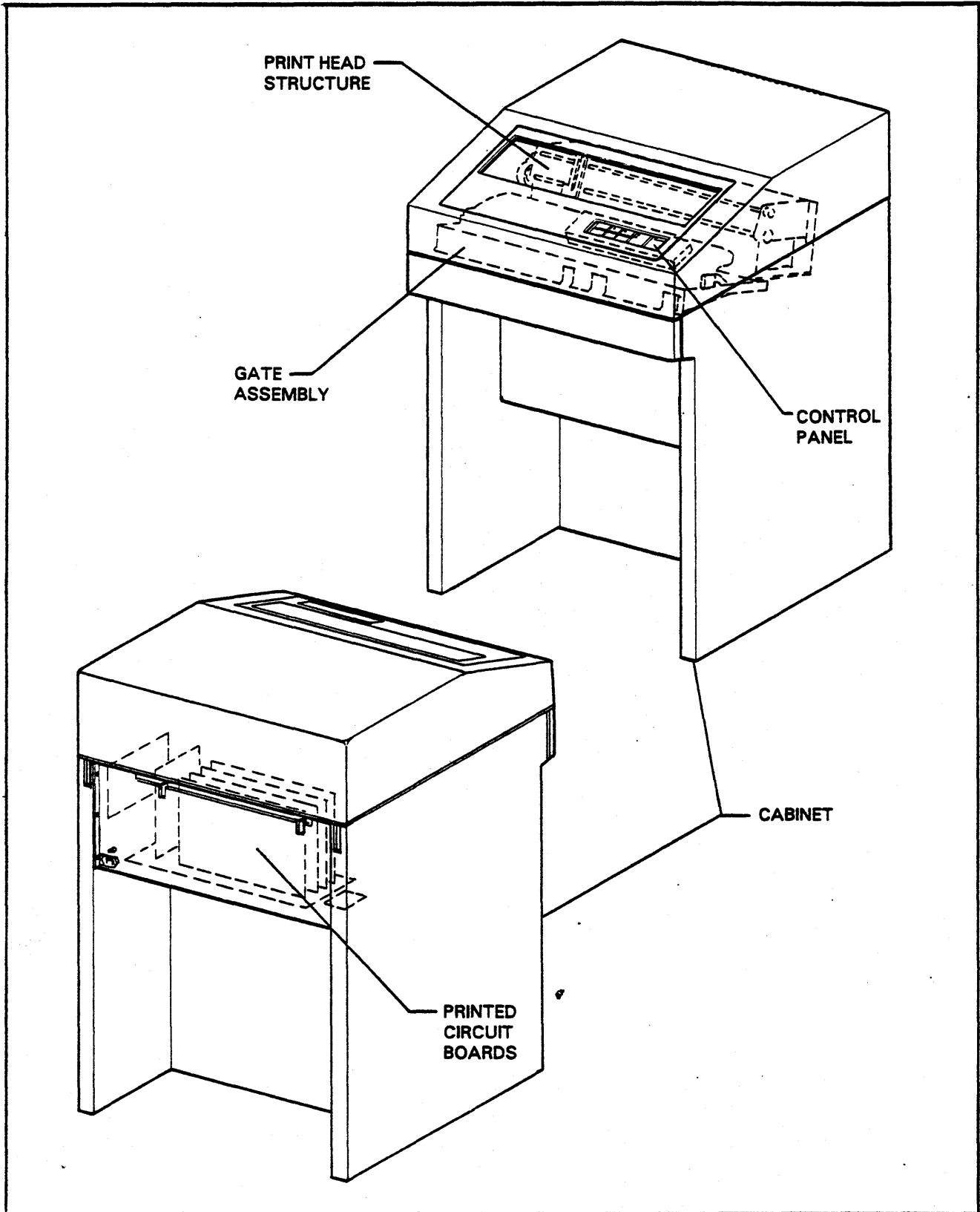


FIGURE 2-1. MAJOR PRINTER ASSEMBLIES

CONTROL PANEL

Control Panel Switches and Indicators (accessible with the bonnet closed)

Start/Stop Switch/Indicator: This is a momentary contact switch indicator. Pressing this switch causes the printer to go RDY if the printer was in the NOT RDY mode and no detectable fault exists. The RDY state is defined as the state in which the printer will respond to On Line operations with the Data Source.

The RDY state will be maintained until the Start/Stop switch is again pressed, or a detectable fault occurs.

Pressing the Start/Stop switch while the printer is printing or moving paper will not inhibit these functions from being completed; however, new data cannot be loaded until the Start/Stop switch is again pressed.

A C.E. Fault causes the printer to go NOT RDY (turns off the START LED). Any one of 4 fatal faults causes the printer to go NOT RDY and to de-energize the 36 VDC power supply. To restart, the printer must be powered OFF and then ON. If the fault reoccurs, the printer should be serviced.

Forms Feed Switch: This is a momentary contact switch. Pressing this switch causes the paper motion system to advance to the Top of Forms. This switch is only active when the printer is in the NOT RDY condition.

Test Print Switch/Indicator: A momentary contact switch with an LED indicator which initiates a Test Print pattern internal to the printer. This switch is active when the printer is NOT RDY. The test pattern results from the setting of DIP switches found on the Control Panel and controller board.

Reset Switch: Reset switch is a momentary contact switch which allows the operator to reset or override a number of the correctable faults. Pressing the switch will clear the fault condition and provide a display of FAULT RESET (FRES) while the switch is pressed. This switch will not clear Customer Engineer type faults or some major hardware fault conditions or true operator correctable faults such as Out of Paper. The switch may also be used to reset the Alarm which is activated by a consumable fault (i.e., Out of Paper, Ribbon, or Forms Error) has been detected. The alarm consists of a continuous tone, and may be reset by the Reset switch. In the case of a Ribbon or Forms error both the fault and the

Alarm are reset. In the case of an Out of Paper, only the Alarm is reset.

Single Space Switch: The Single Space switch is a momentary contact switch which provides a single line paper advance when the gate is closed and a vernier motion of the paper when the gate is open. This switch is only active when the printer is in the OFF LINE condition. If the switch is held in the depressed state for over 0.5 seconds, the forms will increment at a rate of 4 steps per second. This motion will cease once the switch is released.

Single Cycle Switch: The Single Cycle Switch is a momentary contact switch which allows the user to go into the RDY state (allows ON LINE operation) until a single line of data is transmitted and terminated with a paper motion control code. The switch is active when the printer is NOT RDY and no fault conditions have been sensed. The RDY state will not be removed if the line is terminated with a control code that does not result in paper motion (e.g. a Carriage Return (CR) code).

The switch is intended to allow the operator to readily set up paper (especially pre-printed forms) using the actual Data Source output. When sufficient print out to obtain proper set up has been obtained, the printer would be put into the RDY state with the Start/Stop switch.

Option Switches and Indicators: Available on units equipped with serial interfaces only. Refer to Section V, RS-232 Serial Interface Personality Module.

Power Indicator: A light emitting diode on the main Control Panel that when lit indicates that the ON/OFF switch is on and that the 5 volts is present.

6 LPI Indicator: A light emitting diode which indicates when lit that the vertical pitch is 6 lines per inch. When not lit the vertical pitch is 8 lines per inch. Note, that in the optional EVFU mode the vertical pitch is I/O selectable. If the pitch has been I/O selected, the Control Panel Select Switch is automatically inactive and the pitch selected is displayed by the indicator.

Diagnostic Display: A four digit diagnostic display will indicate the printer internal status and fault conditions.

Exit Roller Switch: Located on the Rear Control Panel of LW455 and LW855 units. When in the Enable position, senses paper jams at the back of the printer and produces a display code.

ON CABINET TYPE MODELS

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Control Panel Switches (accessible with the bonnet open)

6/8 Line Switch: The 6/8 line switch is a non-illuminated single pole slide switch mounted above the DIP switches on the Control Panel. Actuation of this switch should occur with the printer in the Stop mode, and should be followed by a Top of Form. Improper spacing may occur if this procedure is not followed. Note, that in the optional EVFU mode, this switch is disabled if the I/O has selected the vertical pitch. See I/O Selectable 6/8 LPI at the end of this section for more information.

Auto Perf Skip Select Switch: An auto perf skip select DIP switch is provided to allow the operator to activate or inactivate the auto perf skip feature. This switch is one of the DIP switches located on the main Control Panel. Note, that the Auto Perf Skip function is automatically disabled if either the EVFU has been loaded, or if the I/O has selected the vertical pitch.

Variable Forms Length Select Switches: This feature allows the selection of the forms length in inches by setting two thumbwheel select switches located on the Control Panel.

Configuration Test Switch: When this switch is selected and once the Test Print switch is pressed, the printer configuration will be printed. This pattern will result in a printout stating the configuration of parameters within the machine (e.g., Compressed/Standard Pitch, 48/64/96 Character Band, etc.)

Note that in order to obtain intelligible printout, an ASCII type band must be used. If a non-ASCII type band or a band with translator ROM's is used, an ASCII band must be temporarily installed in order to obtain the proper printout.

Character Phasing Switch: The Character Phasing switch is a non-illuminated slide switch mounted to the Control Panel. Sliding this switch left or right while printing provides optimum quality print out.

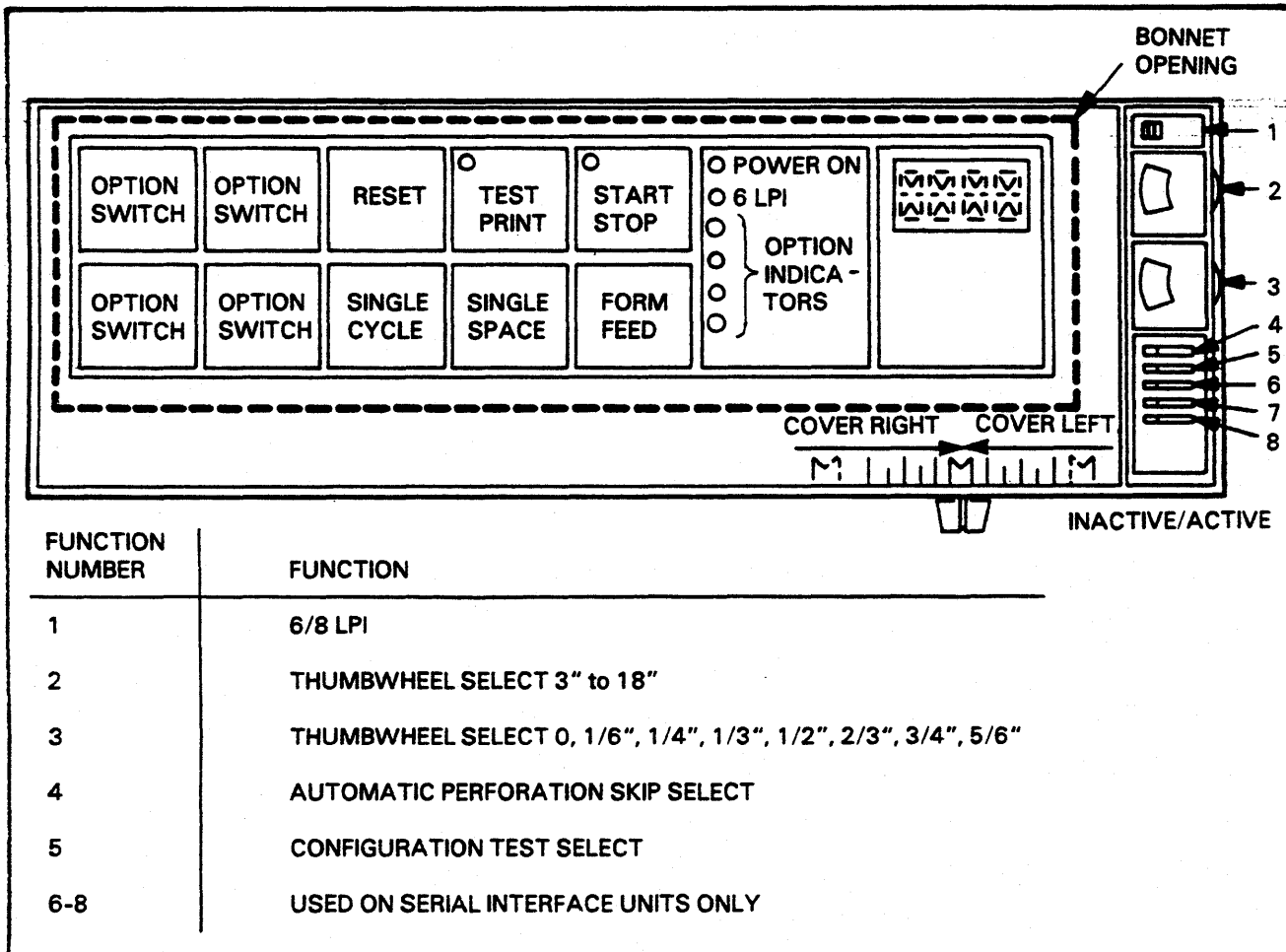


FIGURE 2-2. CONTROL PANEL

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GATE ASSEMBLY

Print Band Drive System

The band drive motor is an AC synchronous motor and the font speed of the print band is 120 inches per second. A unique band drive motor pulley is required for either 50 or 60 Hz operation since the motor is AC synchronous. Both 50 Hz and 60 Hz motor pulleys will be provided with each 50/60 Hz printer. One will be in operation on the motor shaft while the second will be secured to the unit and readily available for a frequency change by the C.E. See the Set-Up and Reference Manual for location of the pulley and input power conversions.

Ribbon Drive System

Ribbon motion is achieved by an AC unidirectional motor which is controlled by the printer. Ribbon motion stops approximately one second after printing to prevent ribbon smear. Ribbon jams within the cassette are minimized by a ribbon resonator which constantly vibrates the ribbon within the cassette. Ribbon motion and presence of ribbon are detected by a sensor which consists of a rotor and hall effect switch. The ribbon cassette, ribbon rollers and ribbon shield are operator changeable and are documented in the operator cards located in the top of the band cover.

Optional EVFU Tape Drive

This option allows loading of vertical formatting instructions by means of a punched tape. The tape travels through a twelve channel LED reader and loads the printer's format buffer. The tape is read one of two ways: If a tape is installed at power-up it is read automatically, if the printer's already powered-up then a tape is installed, the tape will be read once the Load EVFU switch is pressed. The maximum form length allowable is 22 inches at eight lines per inch.

PRINT HEAD STRUCTURE

The print head structure contains three major assemblies; the hammer bank, horizontal shift mechanism and a vertical drive mechanism.

Hammer Bank

The hammer bank consists of 68 hammers and push rods which are assembled in two rows. The hammers move in a linear direction. Hammer movement is achieved by sliding push rods. The linear movement

of the hammers provides true lower case (clear ascenders and descenders with underscoring ability) print out.

Horizontal Shift Mechanism

The horizontal shift mechanism shifts the hammer module assembly left and right by the use of a stepper motor. In standard pitch the hammer module assembly shifts in two positions in 0.1 inch increments. In compressed pitch the hammer module assembly shifts in three positions in 0.06 inch increments.

A diagnostic routine, "Horizontal Set Up", is available for setting up the horizontal alignment.

Vertical Drive Mechanism

The vertical drive mechanism controls the movement of forms through the tractors by use of a stepper motor. The average slew speed for paper motion for multiple line skips is 15 inches per second. The stepper motor will accomplish a single line forms advance in 30 msec.

Vertical forms advance may be operator selected at either 6 or 8 lines per inch by use of a switch located on the Control Panel. Usage of a special feature, half line feed, via the I/O allows operation at 12 lines per inch.

A diagnostic routine, "Exercise Vertical", is available for testing the vertical advance system. Without EVFU loaded a single line advance will occur when this routine is employed. With EVFU loaded the vertical advance system will advance to each channel selected and provide a print out of the channel selected at that time.

Forms Sensing

Paper Motion Verification: A forms motion sensor is provided that detects a paper jam or tear condition within 28 lines of the fault when printing at either 6 or 8 lines per inch respectively and inhibits further printing. When paper motion stops, the printer detects the stoppage and will initiate the following actions:

1. If the fault occurred while the printer was Off Line, "FRMS" will appear on the printer's Status Display and:
 - a. Printing will stop at the end of the current line.
 - b. Any stored paper motion commands will be completed.
 - c. The printer's alarm will be heard.

2. If the fault occurred while the printer was On Line, "PJAM" will appear on the printer's Status Display and:
 - a. Printing will stop at the end of the current line.
 - b. Any paper motion in progress will stop.
 - c. Any other paper motion commands will be stored until the fault is cleared and the On Line status is restored.
 - d. The printer's alarm will be heard.

To resume printing, the operator must push the RESET switch to clear the printer's alarm, correct the paper stoppage condition and resume printing.

Paper Out Detection: An Out of Paper (OOP) condition will be detected and displayed by the printer controller when one of the following conditions occur:

1. Power on with no paper in machine.
2. When the printer is printing and the paper low switch detects the absence of paper, the printer will continue to accept data and print until the Bottom of Forms channel is reached. Upon detection of the Bottom of Forms channel, no more data will be accepted, and the printer will be placed in the NOT READY condition.
3. If the printer is in the NOT READY mode and the paper low switch detects the absence of paper below the print station.

Any of the above conditions will keep the printer in the NOT READY state until the Out of Paper condition has been removed.

PRINTED CIRCUIT BOARDS

Input Power Board (1PC6)

The input power board provides AC and DC power inputs and outputs to the printer as follows:

- a. 100/120V 60 Hz AC in.
- b. 100/220/240V 50 HZ AC in. (100/220V Selectable on 1BP1, SW1) on early units. On later units, 240V, 50HZ is selected by relocating backplane connector P8/P14 to 240V location J14. For 100/120/220VAC, relocate backplane connector P8/P14 to 120/220V location J8.
- c. 10/25/50 VAC transformer output to the hammer driver board.
- d. 120 VAC output to EVFU, blower, band motor and ribbon motor plus one spare output.
- e. +10V, +25V and +50V DC outputs.

Personality Module (1PC1)

There are many different configurations of personality modules. Their purpose is to allow communication between the data source and printer without

changing any other printed circuit boards. All personality modules are equipped with the following features:

- a. Allows the user to interface with various data source configurations.
- b. A basic Controller Bus I/O.
- c. Employs a 8048 microprocessor.

CPU Board (1PC2)

The CPU board is controlled by an 8085 microprocessor. An 8048 microprocessor is employed for band and HEP pulses. The board is equipped with feature select switches listed below:

- a. Auto Line Feed
- b. 132/136 Column
- c. *FLC (Forms Length Control)
- d. *IOVFU/TLVFU (I/O Vertical Formatting /Tape Load Vertical Formatting)
- e. *BOF Channel (Bottom of Form Channel)
- f. Perf Length (3,4,5, or 6 line skip over perforations)
- g. TOF Select (Slew To/Slew Thru (Top of Form))
- h. *VT Select (Vertical Tab Select) Channel 3 or 4 of format tape.

The Centronics CPU board performs the same function but does not come equipped with select switches designated with an asterisk () and contains a "Print Bottom of Form Line" switch.

These boards are also equipped with optional RAM for additional status display.

Print Head Electronics Board (1PC3)

The print head electronics board controls the following components:

- a. Driver electronics
- b. Fault sensing
- c. Vertical and horizontal stepper motor drive
- d. Character phasing control
- e. Home and character pulse synchronization on the print band
- f. Print band motor control
- g. Houses the +5V regulator circuitry.

Hammer Driver Board/s (1PC4 LW400, 1PC4 & 1PC5 LW800)

The hammer driver board employs or controls the following components:

- a. Shift registers and timers are controlled by gate arrays.
- b. 3 amp darlingtonts are used to control the timer input signals.
- c. Controls the hammer fire timing.
- d. Houses the +36V regulator circuitry.

SECTION III PRINTER OPERATION AND OPERATING PROCEDURES

This section contains information on basic printer operation (less the Personality Module), basic operating procedures and built in printer diagnostics. The Personality Module (documented in Section V), may modify the information in this section. In case of conflict, the information documented in Section V prevails.

PRINT BANDS

Print bands are composed of continuous loop, engraved steel and are operator installable. There are 384 characters per band which are grouped into various sets (or fonts). There are two types of bands available, standard pitch or compressed pitch. Both types of bands have character pulse lines beneath each character on the band. Standard pitch print bands have one home pulse timing mark above the beginning of every font, compressed pitch bands have two timing marks above the beginning of every font. Statistical bands can be in standard or compressed pitch and are identified by three or more timing marks. The font speed is 120 inches per second and the maximum hammer repetition rate is 3.5 msec regardless of the band installed. Character sets of 48, 64, 96, 128, or 192 (Statistical Band) are available.

The printer is equipped with an early end of print detection (EEOP) feature. This is a technique used within the control electronics which senses the completion of printing. For typical text patterns, throughput increases of 15% or more may be realized because of this feature.

Statistical Band Option

With this option fonts may be grouped in an optimized fashion to increase print speed and/or print band life. The electronics will be capable of identifying a maximum of 256 different characters located in any of the 384 available character locations. The speed and/or life increase will be a function of the specific application in conjunction with the print band tailored for it. This option will work with either standard pitch or compressed pitch print bands, and is identified by 3 or more home marks above the characters.

These bands have character arrangements which minimize the number of low usage characters on the band (an example would be in a 64 character set there are 16 characters which are seldomly used) or maximize the number of high usage characters. This option requires the installation of the appropriate band and its corresponding PROM. The statistical band is also automatically sensed by the controller.

NUMBER OF CHARACTERS PER SET	NUMBER OF SETS PER BAND	LINES PER MINUTE VS. CHARACTERS PER INCH (CPI)	
		LW400	LW800
48	8	360 at 10 CPI, 240 at 15 CPI	720
64	6	300 at 10 CPI, 200 at 15 CPI	600
96	4	220 at 10 CPI	440
128	3	180 at 10 CPI	360
192	2	120 at 10 CPI	240

COLUMN CAPACITY

132 columns (66 hammers) or 136 columns (68 hammers) in standard pitch.

198 columns (66 hammers) or 204 columns (68 hammers) in compressed pitch.

PAPER ADVANCE TIMING

The stepper motor forms advance will accomplish a single line advance in 30 msec (max). The average slew speed for paper motion through multiple line skips is 15 inches per second.

The maximum allowable continuous print rate of the printer is 500 lpm for LW400 units and 1000 lpm for LW800 units. Because of the Statistical Font and Early End of Print features in normal field applications some lines will be printed at a higher speed than mentioned above.

VERTICAL MOTION FORMATTING

There are three types of vertical formatting available; FLC (Forms Length Control) switches on the Control Panel, IOVFU (I/O Loadable Vertical Format) over the interface lines and TLVFU (Tape Loadable Vertical Format) which employs a tape reader and a punched format tape to load vertical format instructions.

FLC (Forms Length Select) Switches

These switches are located on the right side of the Control Panel beneath the bonnet. The top switch allows selection of whole inches from 3 to 18 inches. The bottom switch allows fractional settings of 0, 1/6, 1/4, 1/3, 1/2, 2/3, 3/4 and 5/6 inch. The total form length is the sum of the two switch settings. Before this feature can be used it may be necessary to set switches on the CPU board (1PC2) to the ON position depending which CPU board is installed. Refer to the Maintenance Manual (Fault Isolation section) for switch set up.

These switches should be set such that when added together they equal the form length (as measured from perforation to perforation). The printer automatically calculates the number of lines within the page based on the setting of the 6/8 LPI select switch and these switches. Note that the changing of the 6/8 LPI switch in mid page may cause the top

of form (TOF) position to become misadjusted. A "PAGE" error will indicate this loss of TOF position on the Control Panel's display. It is recommended that the selection of 6 or 8 LPI occur only at the TOF position.

Perforation Skip Length Select Switches: These switches allow selection of the number of lines skipped over perforations between the bottom and top of forms. These switches select a 3,4,5 or 6 line skip. These are only active in the FLC mode and when the APS switch on the Control Panel is turned on. Before this feature can be used it will be necessary to set switches on the CPU board (1PC2). Refer to the Maintenance Manual (Fault Isolation section) for switch set up.

12 Channel Electronic Vertical Format

This option allows the substitution of the FLC switches on the Control Panel with an electronic data storage capability which allows the user to store a representation of channels or positions along the form which can then be selected by control codes. The channel information is stored in a RAM buffer and is available in an I/O loadable configuration (IOVFU) or a tape loadable version (TLVFU). The tape loadable version provides a 12 channel LED tape reader which loads automatically on power up or upon command from the operator. After loading, the tape drive unit does not move, thereby eliminating any tape or mechanism wear.

The buffer provides storage for up to a 22.5" form at 8 lines per inch. Selection of 6 or 8 lines per inch may be made by the Control Panel Select switch or via the I/O. The EVFU versions (IOVFU and TLVFU) are selected by the setting of DIP switches on the CPU board when the option feature has been installed. Refer to the Maintenance Manual (Fault Isolation section) for switch set up.

Printers with Centronics I/O's attempt to load the format buffer from a tape (TLVFU). If a successful load can not be achieved the vertical format will default to the Forms Length Control (FLC) switches on the Control Panel. A switch is available on the tape reader which will enter any additional tape loads. A data source format load (IOVFU) can be performed at any time and will replace any existing format presently in the VFU buffer.

TABLE 3-1 EVFU LOAD FORMAT

EVFU LOAD CONTROL CODES

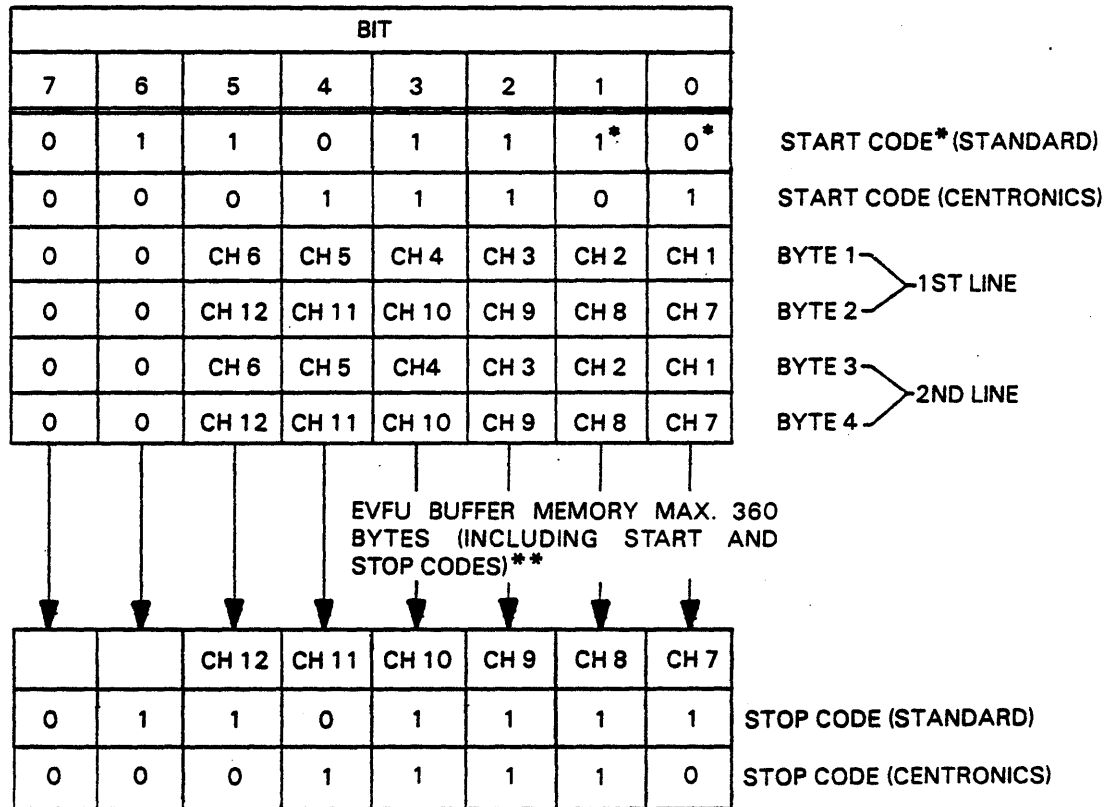
ALL INTERFACES EXCEPT CENTRONICS

BIT	7	6	5	4	3	2	1	0	HEX	FUNCTION
	0	1	1	0	1	1	1	1	6F	END OF EVFU DATA (STOP CODE)
	0	1	1	0	1	1	0	0	6C	START OF EVFU DATA - SELECT 6 LPI
	0	1	1	0	1	1	0	1	6D	START OF EVFU DATA - SELECT 8 LPI
	0	1	1	0	1	1	1	0	6E	START OF EVFU DATA
	0	1	1	0	0	0	1	1	63	RESET EVFU LOADED

CENTRONICS INTERFACE ONLY

	0	0	0	1	1	1	0	1	1D	START OF EVFU DATA
	0	0	0	1	1	1	1	0	1E	END OF EVFU DATA (STOP CODE)

EVFU DATA LOAD FORMAT



* May be one of three start codes:

- 6E (Hex) Start of EVFU Load
- 6C (Hex) Start of EVFU Load, Select 6 LPI
- 6D (Hex) Start of EVFU Load, Select 8 LPI

** Some Personality Modules limit the EVFU buffer memory to a max. of 288 bytes.

I/O Loadable Vertical Format Unit (IOVFU):
The I/O loadable version of EVFU provides memory storage for up to 180 lines (360 bytes of storage). Certain personality modules will limit the total lines to 144 (288 bytes of storage). Each data byte transferred provides 6 channels of vertical format data with channels 1 thru 6 represented by an odd byte, and channels 7 thru 12 represented by an even byte. A format channel selection is represented by a "1" bit in its respective location.

Data in the format buffer is formatted with a start code followed by EVFU data followed by a stop code. See Table 3-1 for Start/Stop codes.

The first line of EVFU data transferred is maintained as the top of the EVFU memory. Normally, this first line would be Format Channel 1 (Top of Forms channel). The data in the EVFU memory can be recirculated to the top (first line received) by the reception of a stop code only during an EVFU transfer.

Note, that the paper must be aligned such that the first line of EVFU data transferred is coincident with the paper position desired at the print station. This synchronization action can be done before or after EVFU load.

The EVFU data has to contain a Top of Forms channel (Channel 1). If no Channel 1 is received and a Form Feed Control Code is received from the I/O or if a Form Feed from the Control Panel is attempted, an error will be generated.

The stop code defines the end of the EVFU data. If the stop code is not found in the buffer, a format load error will be generated.

If the IOVFU mode is selected and the EVFU data is not loaded, format operations may be programmed according to Forms Length Control (FLC) switches. The standard ASCII codes are then recognized as the paper motion codes and the forms length is defined by the FLC switches.

Note, that the stop code can be used to position the data in the EVFU buffer to the first line received. If a load EVFU occurs with a stop code as the only data received, the EVFU data will be repositioned such that the first line received will be at the top of the memory. (Corresponds to the position at the print station.)

Tape Loadable Vertical Format Unit (TLVFU):
A tape loadable version of EVFU is available which adds a tape reader, and removes the requirement of loading the Format Buffer via the system interface. See Format Tape Preparation following for instructions on how to punch a format tape. The loading of the Format Buffer is initiated on power up or upon depression of the Load EVFU switch located near the vertical tape reader. The format tape is moved only during the load operation, and therefore is not coupled to the paper drive mechanism. The Load EVFU switch is only active when either of the EVFU modes (IOVFU or TLVFU) is selected, and the printer controller is off line.

The Tape Loadable version of EVFU is selected via DIP switches on the CPU board (except Centronics I/O's). Refer to the Maintenance Manual (Fault Isolation section) for switch set up. Loading of the Format Buffer will occur automatically on power up or upon depression of the Load EVFU switch. The actual data loaded into the Format Buffer will start when a hole is detected in Channel 1 (TOF) and will continue until Channel 1 is again detected. The tape will continue to move and the second detection of a Channel 1 will initiate a verify load. If the tape data during a verify does not agree or if the tape is too long, a Load Error will be generated. Three LOAD/VERIFY attempts will be made before a fault is generated.

Note, that only one hole may be punched in Channel 1 (TOF) for the specified form length since this channel is used to initiate and verify load.

If the tape cannot be successfully loaded, the diagnostic display will indicate "TAPE", (tape error) and the printer will not go Ready. The operator may override this condition by pressing the Reset switch. The printer will now operate in the Forms Length Control mode, and will also allow the loading of IOVFU data if initiated by the data source.

Format Tape Preparation: Format tapes are punched to let the printer know where to advance and stop paper. There will always be a first line of print (top of forms) and a last line of print (bottom of forms) that will have to be punched and laid out for your specific application/s.

Once familiar with punching tapes, you will know to off set the tape by 3 spaces so the splice falls into an area where there are no punched holes. This will eliminate the need for repunching holes over the area where the tape has been glued.

NOTE

FORMAT TAPES ARE ALWAYS PUNCHED IN THE 6 L.P.I. MODE, EVEN FOR USE WHEN THE PRINTER IS IN THE 8 L.P.I. MODE. BEFORE PUNCHING THE FORMAT TAPE THE TOP OF FORMS (CHANNEL 1), AND THE BOTTOM OF FORMS (EITHER CHANNEL 2, 8, 12 OR NO BOF) SHOULD BE KNOWN. CONTACT YOUR CUSTOMER ENGINEER TO DETERMINE WHICH CHANNELS ARE DESIGNATED AS TOP AND BOTTOM OF FORMS. NO OTHER PUNCHES SHOULD APPEAR IN THE LINES (ACROSS THE TAPE) WHERE THE TOP AND BOTTOM OF FORMS IS PUNCHED.

Every line on the 6 L.P.I. or 8 L.P.I. side of the format tape represents a potential line of print when printing in either the 6 L.P.I. or 8 L.P.I. mode. The printer's electronics will interpret only the 6 L.P.I. side of the tape.

Every hole punched represents a specific line on the paper. The paper advances to the desired line, prints the data and scans the format memory for the next channel selected where data should appear.

For example, if channel 1 is designated as the first line of print and channel 2 is designated as the last line of print, 10 channels are left that can reflect different line spacing combinations for different forms that are being printed. If data is to be printed on lines 5, 7, 15, 18, 29, 50, and 61, channel 3 could be selected and punched for this specific format, leaving 9 channels open for different formats.

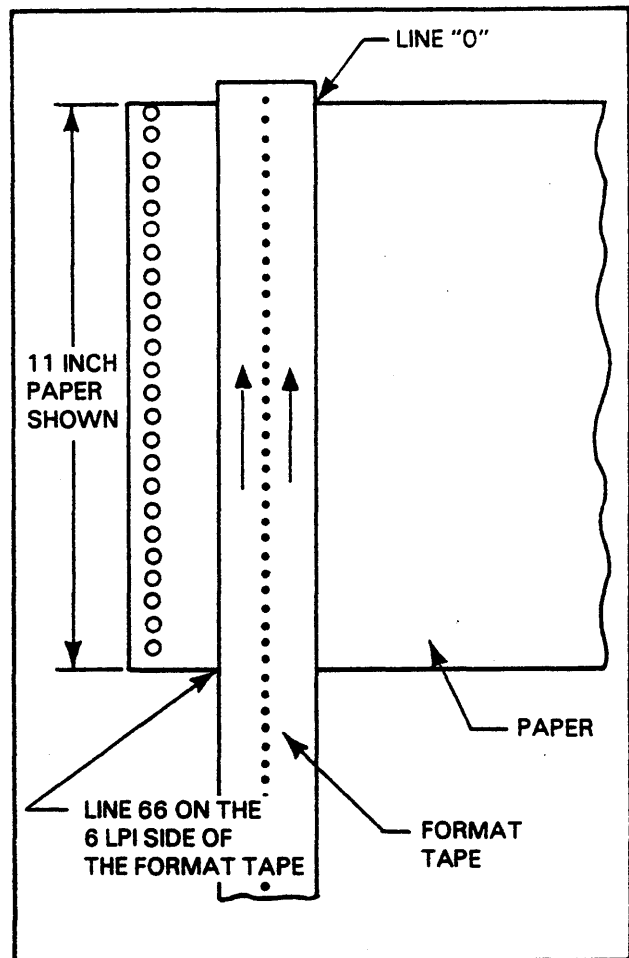


FIGURE 3-1. FORMAT TAPE REGISTRATION - 6 LPI

If printing in the 6 L.P.I. mode:

1. Measure the paper from perforation to perforation. If the paper measures 11 inches or more, it will not be necessary to make a multiple form length tape.
2. If the paper measures less than 11 inches, it will be necessary to punch multiple lengths of the paper (identical hole pattern) in order to get a tape length that measures at least 11 inches. It may be necessary on shorter papers to repeat the punched hole pattern 3 or 4 times until the tape measures at least 11 inches.

CAUTION

DO NOT CUT THE TAPE UNTIL ALL HOLES ARE PUNCHED.

3. Lay the format tape over the paper. Align line "0" directly over the top edge of the paper.
4. Mark the 6 L.P.I. side of the tape where the desired first line of print (top of forms) should appear. Normally this mark would appear within the first 3 lines of the top of the paper. Next to the mark write T.O.F. or first line of print to designate this specific mark as the first line of print.
5. Make sure the line "0" is still registered directly over the top edge of the paper.
6. Mark the 6 L.P.I. side of the tape where the desired last line of print should appear. Normally this mark would appear within the last 3 lines of the bottom of the paper. Next to the mark write B.O.F. or last line of print to designate this specific mark as the last line of print.
7. On paper that measures less than 11 inches, this pattern must be repeated until the format tape length measures at least 11 inches. Each form length punch pattern must be complete from top of paper to bottom of paper.

If printing in the 8 L.P.I. mode:

1. Measure the paper from perforation to perforation. If the paper measures 11 inches or more, it will not be necessary to make a multiple form length tape.
2. If the paper measures less than 11 inches, it will be necessary to punch multiple lengths of the paper (identical hole pattern) in order to get a tape length that measures at least 11 inches. It may be necessary on shorter papers to repeat the punched hole pattern 3 or 4 times until the tape measures at least 11 inches.

CAUTION

DO NOT CUT THE TAPE UNTIL ALL HOLES ARE PUNCHED.

3. Lay the format tape over the paper. Align line "0" directly over the top edge of the paper.
4. Note the line number designation on the 8 L.P.I. side of the tape where the desired first line of print (top of forms) should appear. Normally this mark would appear within the first 4 lines of the top of the paper.

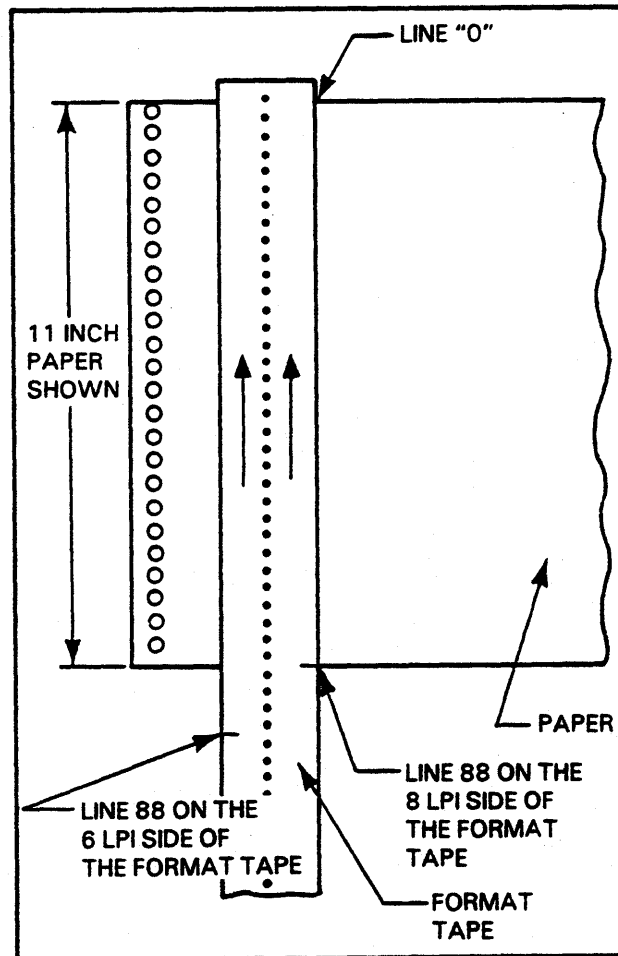


FIGURE 3-2. FORMAT TAPE REGISTRATION - 8 LPI

5. The electronics reads the tape at six lines per inch. 8 L.P.I. line numbers must be marked and punched using the 6 L.P.I. scale (or side) of the tape. On the tape, mark the 8 L.P.I. line number designation on the 6 L.P.I. scale. Write next to the mark "T.O.F." or first line of print to designate the first print line.
6. Make sure the line "0" is still registered directly over the top edge of the paper.
7. Note the line number designation on the 8 L.P.I. side of the tape where the desired last line of print should appear. Normally this mark would appear within the last 4 lines of the bottom of the paper.
8. Mark this 8 L.P.I. line number designation on the 6 L.P.I. side of the tape. Next to the mark write B.O.F. or last line of print to designate this specific mark as the last line of print.

9. On paper that measures less than 11 inches, this pattern must be repeated until the format tape length measures at least 11 inches. Each form length punch pattern must be complete from top of paper to bottom of paper.

Format Tape Punching:

1. Using the square hole format tape punch as illustrated, punch the channels marked on the format tape as follows:
 - a. Position the Line Selector to 6 L.P.I. Slide the format tape until the line to be punched is centered under the punch bar. Engage the format tape with the sprocket pins. Set the Channel Selector to the number of the channel to be punched. Punch the hole by pressing down on the punch bar.
 - b. Advance the tape to the next line to be punched with the Line Advance Tape Control. Select the channel to be punched.

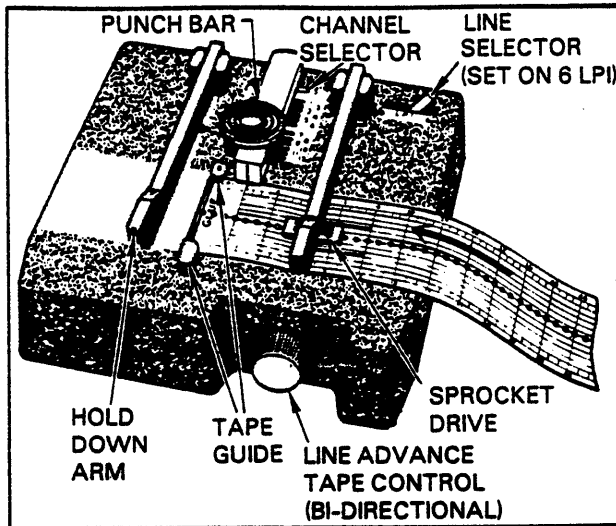


FIGURE 3-3. FORMAT TAPE PUNCH

- c. Repeat steps a and b until all the desired lines are punched.

If a punch other than the 44681276 is used, refer to the illustration, then use the punch manufacturer's instructions.

2. To splice the tape into a loop, apply a thin coat of adhesive across the width of the tape at each end as indicated. Allow the adhesive to dry until tacky. A soft-hardening adhesive should be used for maximum tape life. Recommended adhesives are Carter's Rubber Cement or Duco Cement. If the tape is equipped with self stick tape, peel off the backing and register per step 3.
3. Place the bottom end of the tape over the top end so that the edge butts against the zero sprocket hole line and so that the overlapping sprocket holes compliment each other.
4. Apply pressure to the union until the tape is firmly bonded. Remove excess adhesive.
5. Repunch any holes that were covered up when the tape was glued.

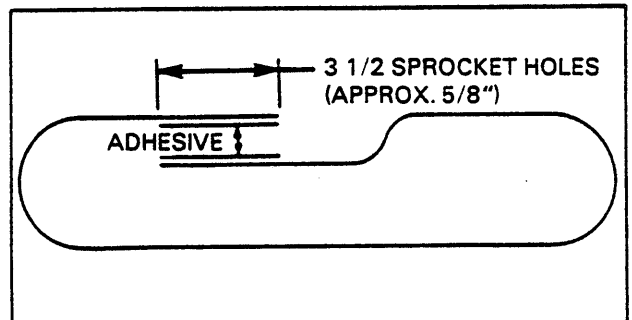


FIGURE 3-4. FORMAT TAPE ADHESION

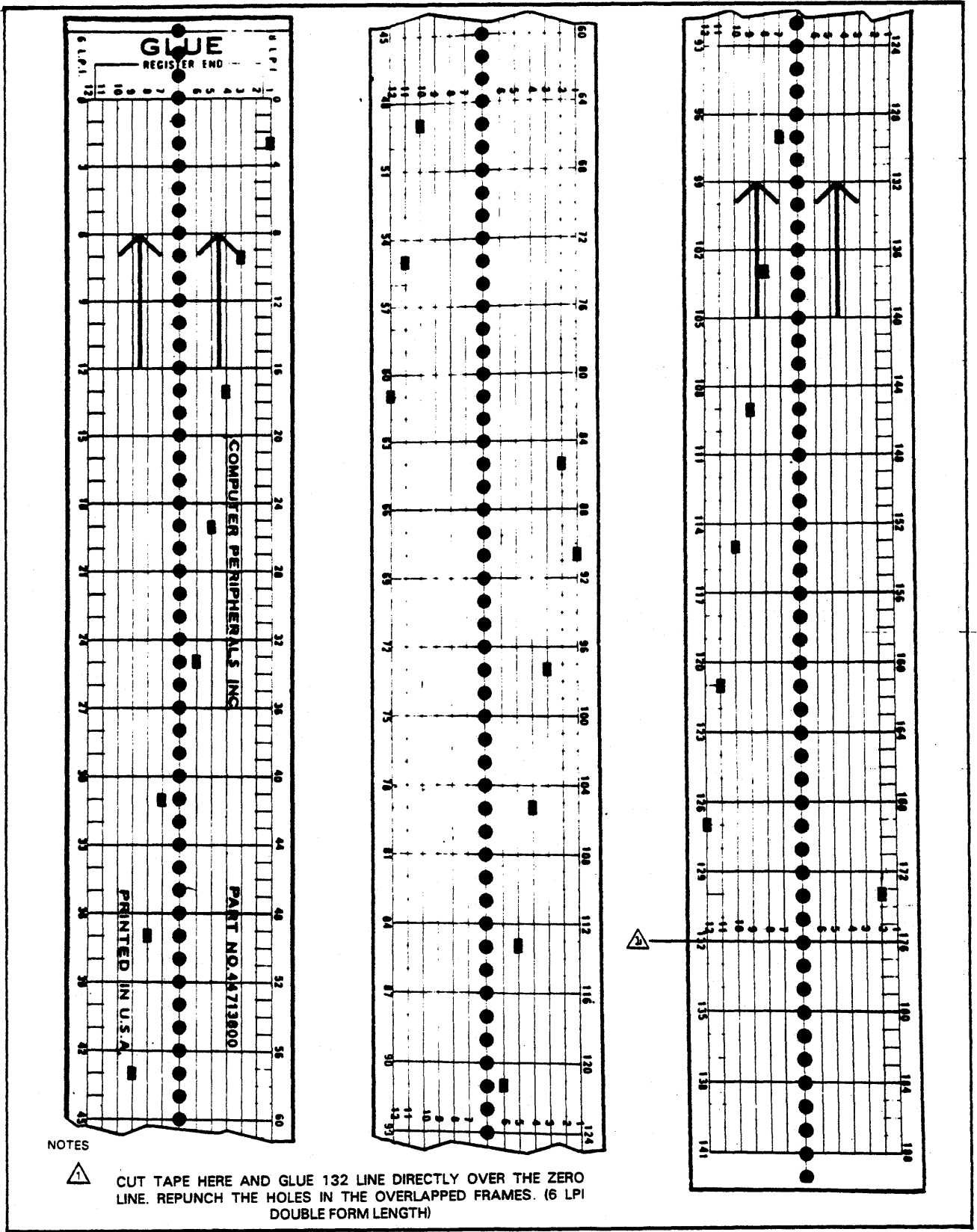


FIGURE 3-5. A PUNCHED FORMAT TAPE (SAMPLE)

Paper Motion Commands and Control Codes

The basic ASCII control codes allow the selection of Line Feed (LF), Vertical Tab (VT), Form Feed (FF), and Carriage Return (CR). In addition, if the eighth bit is a "1", the low order 7 bits indicate the selection of line counter mode, and if the eighth bit is a "0" and the seventh bit is a "1", one of the 12 format channels is selected. The Half Line Feed code (DC1) is considered an illegal code if either the EVFU is loaded or if the Line Counter only mode is enabled. The control code configuration is the same for TLVFU and IOVFU. If the ninth bit (the paper instruction line) is a "1" the data is interpreted as paper motion commands. If it is a "0" the data is interpreted as ASCII characters or control codes.

A Reset code (63 hex) can be used to reset all EVFU related conditions to their initial state.

The Data Products compatible personality module limits the amount of lines that can be advanced to 15 line spaces with a 4 bit line counter and 63 line spaces with a 6 bit line counter. See Table 3-2.

The transmission of a Start code (6E or 1D hex) followed by a Stop code (6F or 1E hex) (See Figure 3-1) will place the printer controller in the line counter only mode. In this mode it is possible to select line counter commands without loading the EVFU. This mode may be reset by the transmission of a STOP code or a Reset code. Note also that line counter commands are always valid if the EVFU has been properly loaded, or if the Line Counter On Power Up switch is enabled.

I/O Selectable 6/8 LPI

When either of the EVFU modes (IOVFU or TLVFU) is selected, the I/O may select the vertical pitch by the use of control codes. These codes allow the selection of 6 or 8 lines per inch at the discretion of the data source. This feature may be used in one of two ways. First, the appropriate start code can be placed at the beginning of the EVFU data automatically selecting the desired lines per inch for that particular EVFU load. Secondly, if the EVFU is not loaded, it is possible to select the vertical pitch when operating in the default mode of Forms Length Control (FLC). In this case, an EVFU load with a vertical pitch select start code (6C or 6D Hex) followed by a stop code will select the appropriate vertical pitch.

Note, that the I/O selectable pitch mode requires that the data source insure that the number of lines at 6 LPI and the number at 8 LPI, for a given page length, are an even multiple for that page length. If this does not occur, the Top of Form to paper position alignment will be disturbed and a "PAGE" error will result. To help insure that the data source has total control over the page configuration, the Auto Perf Skip is disabled when the I/O has selected the vertical pitch.

When I/O selectable pitch mode is selected, the 6/8 LPI select switch on the Control Panel is disabled. For this reason, the I/O should always remove the I/O selectable mode by the sending of a standard start/stop code or Reset Code when terminating a particular job.

Line Counter Only Mode

The Transmission of a standard Start code (6E hex) followed by a Stop code (6F hex) will place the printer controller in the line counter only mode. In this mode it is possible to select line counter commands without loading the EVFU.

TABLE 3-2. PAPER MOTION COMMANDS AND CONTROL CODES

PAPER INSTRUCTION LINE									HEX	FUNCTION	}	
BIT	8	7	6	5	4	3	2	1				0
	1	0	0	0	0	1	0	1	0	0A	LINE FEED (LF)	PAPER MOTION CONTROL CODES
	1	0	0	0	0	1	0	1	1	0B	VERTICAL TAB (VT) ¹	
	1	0	0	0	0	1	1	0	0	0C	FORM FEED (FF)	
	1	0	0	0	0	1	1	0	1	0D	CARRIAGE RETURN (CR)	

ALSO SEE TABLE 3-1 FOR EVFU CONTROL CODES

1	0	1	X	0	0	0	0	0
↓	↓	↓	↓	↓	↓	↓	↓	↓
1	0	1	X	0	1	0	1	1
1	0	1	X	X	1	1	0	0
1	0	1	X	X	1	1	0	1
1	0	1	X	X	1	1	1	0
1	0	1	X	X	1	1	1	1

CHANNEL 1
↓
CHANNEL 12
ILLEGAL CHANNEL SELECTED

} PAPER MOTION COMMANDS

X = DO NOT CARE BIT

1	1	0	0	0	0	0	0	0
↓	↓	↓	↓	↓	↓	↓	↓	↓
1	1	1	1	1	1	1	1	1

LINE COUNTER OPTION
MOVE 0 LINE SPACES
↓
MOVE * LINE SPACES

*
4 BIT COUNTER = 15 LINES
6 BIT COUNTER = 63 LINES
7 BIT COUNTER = 127 LINES



VT SELECTS CHANNEL 3 OR 4 IF EVFU IS LOADED. IF EVFU IS NOT LOADED, VT WILL GENERATE A "CHSL" ERROR AND A SINGLE SPACE PAPER MOTION. REFER TO THE MAINTENANCE MANUAL (FAULT ISOLATION SECTION) FOR SWITCH SETUP ON THE CPU BOARD (1PC2).

2

BITS 1 THRU 7 REPRESENT BASIC PRINTER CONFIGURATION.—CERTAIN PERSONALITY MODULES MAY ALTER THIS CONFIGURATION. SEE SECTION V FOR DETAILS.

STATUS/FAULT CODES

The following faults and statuses are provided as information on the codes the printer is capable of displaying and their definitions. Because of the printer's software it is possible to receive an endless number of codes on the Status Display. The following list are codes which require either intervention by the operator, the C.E., or are simply status codes which require no intervention.

Corrective action for operator correctable faults are documented in the operator instruction cards in the band cover beneath the bonnet. C.E. correctable faults are documented in Section X. Status codes which appear do not require corrective action as they indicate the normal internal status of the printer.

Operator Correctable Faults

Display	Definition
BAND	Type of band not detected
BATO	Buss available failed to go active within 1.5 seconds of load complete.
BMSE	Band motor speed error
BSE	Band sync error
CHAN	Channel selected that was not loaded
CHSL	Channel selected and EVFU was not loaded.
CR > 5	More than five consecutive carriage returns
DOVF	Data overflow error
DVFU	Error in data format (IOVFU or TLVFU)
FRMS	Paper not moving (paper jam)(while Off Line). Engage Idler Roller at back of printer if installed.
GATE	Gate/band cover interlock open
IINH	Power-up inhibit failed to go active
ILCD	Illegal control code received
ILCH	One of the four illegal EVFU channels selected
INIT	Processor executed an illegal code
IOPE	I/O parity error was detected
IPRG	I/O microprocessor has addressed a wrong location in program memory.
LCSL	Line counter command selected and EVFU was not loaded
LPTO	Load in process remained active
NOLD	Attempt to load TLVFU when diagnostic ROM not installed or attempt to load IOVFU when in Forms Length Control mode
NTOF	A channel 1 (top of form) was selected but was not loaded
NVCM	A control code was detected but it was not considered valid

Operator Correctable Faults (Continued)


Display	Definition
OOP	Out of paper
OVFL	Maximum memory capacity exceeded
PAGE	A combination of 6 and 8 lines per inch has occurred which was not compatible with selected page length
PJAM	Paper not moving (paper jam)(while On Line)
RDR	A tape reader problem
RIB	Ribbon system problem
RNWX	Excessive paper motion when under I/O control
RYON	The controller failed to go not ready
TAPE	Attempt to load TLVFU with no tape
VFER	Vertical format error-the Page Length Select switch setting on right side of Control Panel is in conflict with 6 or 8 line per inch setting.
VRFY < 3"	Three reads of tape did not verify Forms length of less than three inches selected

C.E. Correctable Faults

Display	Definition
*BLWR	Blower failure
FUS 2	Clamp fuse blown
*FUS 3	Stepper fuse blown
*FUS 4	Upper Hammer fuse blown
*FUS 5	Lower Hammer fuse blown
HERR	Horizontal position error
*HMR 1	Hammer coil current fault (upper bank)
*HMR 2	Hammer coil current fault (lower bank)
INH	Power on reset hardware fault
IOER	Adaptor card hardware fault
NHOM	Horizontal error on homing attempt
PRT 1	I/O port 1 failure
PRT 2	I/O port 2 failure
PRT 3	I/O port 3 failure
PRT 4	I/O port 4 failure
*PWR 1	Hammer voltage fault (36V)-1PC4
*PWR 2	Hammer voltage fault (36V)-1PC5
RAM1	Buffer RAM failure
RAM2	Buffer RAM failure
ROM1	Program ROM failure
ROM2	Program ROM failure
*STPR	Stepper fault-improper phases active
8048	Band tracking CPU failure
8155	Scratchpad RAM or port 5 failure
8253	Counter timer failure

*Flashing display- Printer will go Not Ready and will desequence the 36 VDC power supply.

Status Codes

Display	Definition
FMTD	Off line form feed active or Form Feed switch is pressed
FRES	Reset switch on Control Panel pressed
HMTN	Horizontal motion cycle in process
HOME	Diagnostic status. Indicates the home position transducer is active
LFSW	Off line Single Space switch is pressed
LIP	I/O data transfer in progress
LVFU	EVFU mode selected and EVFU not loaded
NFLT	Normal printer status. No faults exist.
NHOM	Diagnostic status. Indicates the home position transducer is not active
NOLD	Diagnostic status. Indicates an off line EVFU load routine has been actuated but EVFU mode is not selected
NUTS	Band not up to speed
PHA	Diagnostic status. Indicates phase applied to horizontal stepper motor
PHB	Diagnostic status. Indicates phase applied to horizontal stepper motor
PHC	Diagnostic status. Indicates phase applied to horizontal stepper motor
PHD	Diagnostic status. Indicates phase applied to horizontal stepper motor
PMTN	Paper motion cycle in process
PRNT	Print cycle in process
SREQ	An I/O status request is in process
TLIP	A tape load is in process
TLSW	Tape Load switch is being pressed.
TPSW	Off line Test Print switch is being pressed
	Diagnostic status. Indicates display segment test is in process

Interface Status Codes (RS-232 Only)

Display	Definition
KCC	Invalid control code
ICS	Invalid control sequence
IHT	Invalid horizontal tab load
ILBO	I/O line buffer overflow (right margin).
IRAM	I/O RAM error
IROM	I/O ROM error
ITRN	I/O transmission error
IVFU	Invalid EVFU load
NVER	Non volatile option store error. Press "I/O FLT RESET" switch on Control Panel to continue. Option settings may have changed. Check and correct if necessary.

TEST PRINT FEATURES

There are built in printer tests which are available to the Customer Engineer. These tests are used in conjunction with the Test Print switch on the Control Panel and require certain switches on the CPU board to be set up. The available tests are documented in Section 6 and listed as follows:

- a. All one character
- b. Sliding Alphabet
- c. Horizontal Motion (Move Hammer Bank)
- d. Horizontal Set-Up
- e. Vertical Motion (Exercise Vertical System)
- f. Load EVFU (Off Line EVFU Load)
- g. Display Test (Control Panel Lamp Test)
- h. Run Ribbon and Band
- i. Examine Print/EVFU/Status Memory
- j. Configuration Printout (Print out configuration of printer).

SECTION IV INPUT POWER BOARD + AC/DC DISTRIBUTION

This section contains information on the input power voltages, optional input voltages and D.C. voltages necessary to drive the printer's electrical components. Refer to Section XI for wiring information.

INPUT POWER

The printer comes from the factory specifically wired for your application. Conversion within the printer from one frequency of operation to another is only available on optional 50/60 Hz units. The conversion requires reprogramming the ac power board plug for the required configuration if the unit is equipped with a universal programming board (4PC1) as shown in Figure 4-1, or by repositioning fast-on terminal connectors to new positions on a terminal strip as shown in Figure 4-2, and changing the 50 HZ or 60 HZ band pulley. 60 HZ units come equipped with a power cord and is terminated with a non-locking 3 prong plug, 50 HZ units come equipped with a power cord which is terminated without a plug at the wall plug end. Refer to Figure 4-1 for input power frequency modifications for early units with a universal programming board. Refer to Figure 4-2 for input power frequency modifications for units with a terminal strip. The extra 50 Hz or 60 Hz band pulley is stored on early units, in an accessory box. In later units it is stored in the printer's interior and is located beneath the right rear power board cover (as viewed from the front of the printer with the bonnet open).

The following voltages are available with the optional 50/60 Hz transformer:

60 HZ	50 HZ
100 VAC	100 VAC
120 VAC	220 VAC
	240 VAC

Voltage regulation is achieved by the use of a ferro-resonant transformer and a resonating capacitor. This resonant circuit increases the flux density, saturating the transformer core on the peaks of the AC alternation producing a near square wave output. By saturating the transformer on the voltage peaks, normal voltage variations in the primary winding will not be present in the output. Therefore, the transformer output will remain almost constant.

AC Output (See Figure 4-1 and 4-2)

The transformer supplies 110 VAC to the blower, band and ribbon motors. The AC power to these motors is controlled by solid state relays (SSR's).

DC Output (See Figure 4-3)

The AC is converted to DC on the Input Power Board. It provides 50V, 25V and 10V to various components. The fused 50V circuit is converted to +36V on the hammer driver board. There is a fused 25V circuit which is used for the vertical and horizontal stepper motors and a 25V unfused circuit which supplies power to the regulator circuitry. There are two 10V fused circuits. One provides power for the paper clamp system, the other provides a regulated +5V which is converted from 10V to 5V on the Print Head board. From there it provides power for the backplane board.

±12VDC Power

There is an optional power supply which provides ±12VDC power for RS-232 serial interface personality module printers. This voltage is used to drive the transmitters and receivers on the I/O adaptor board.

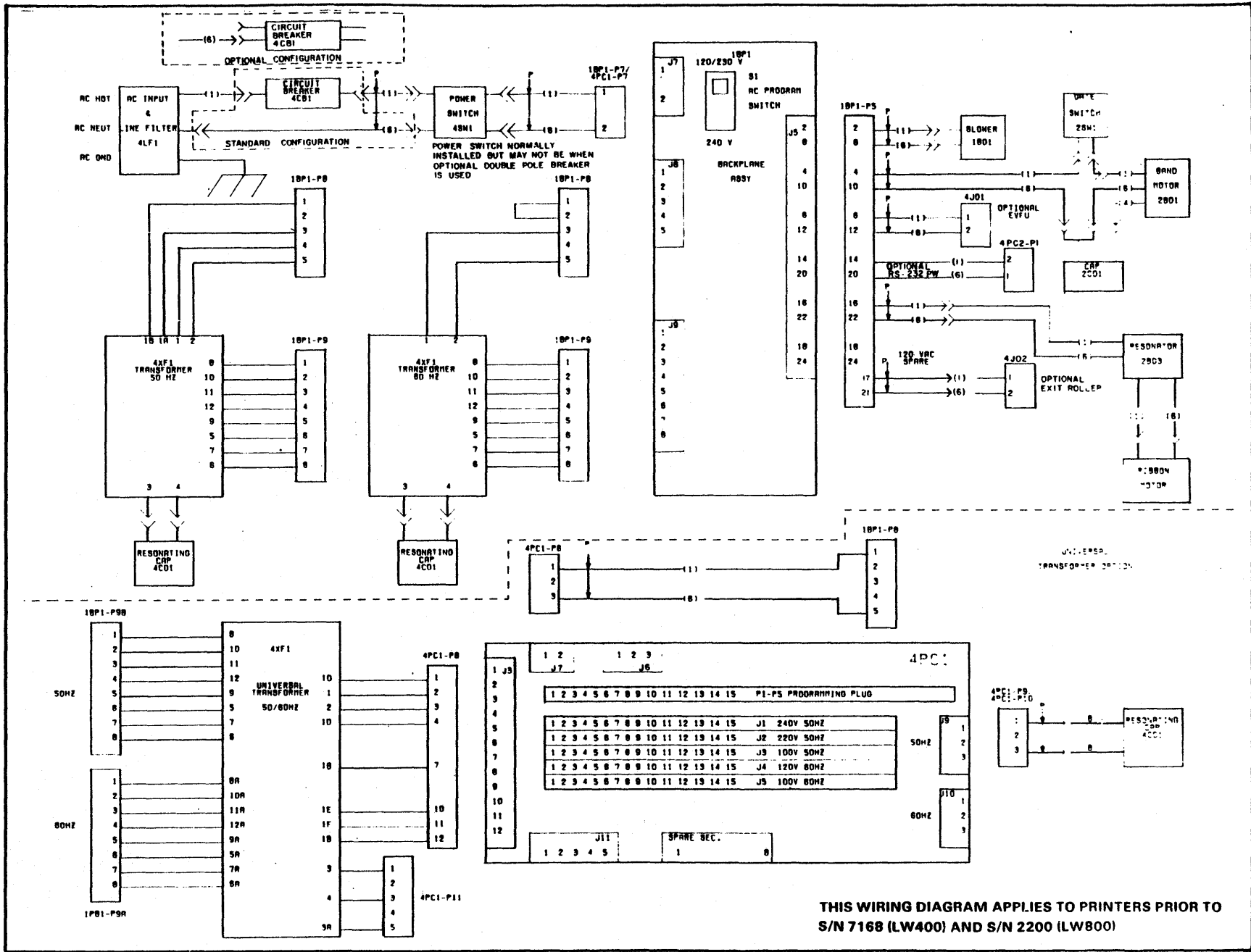
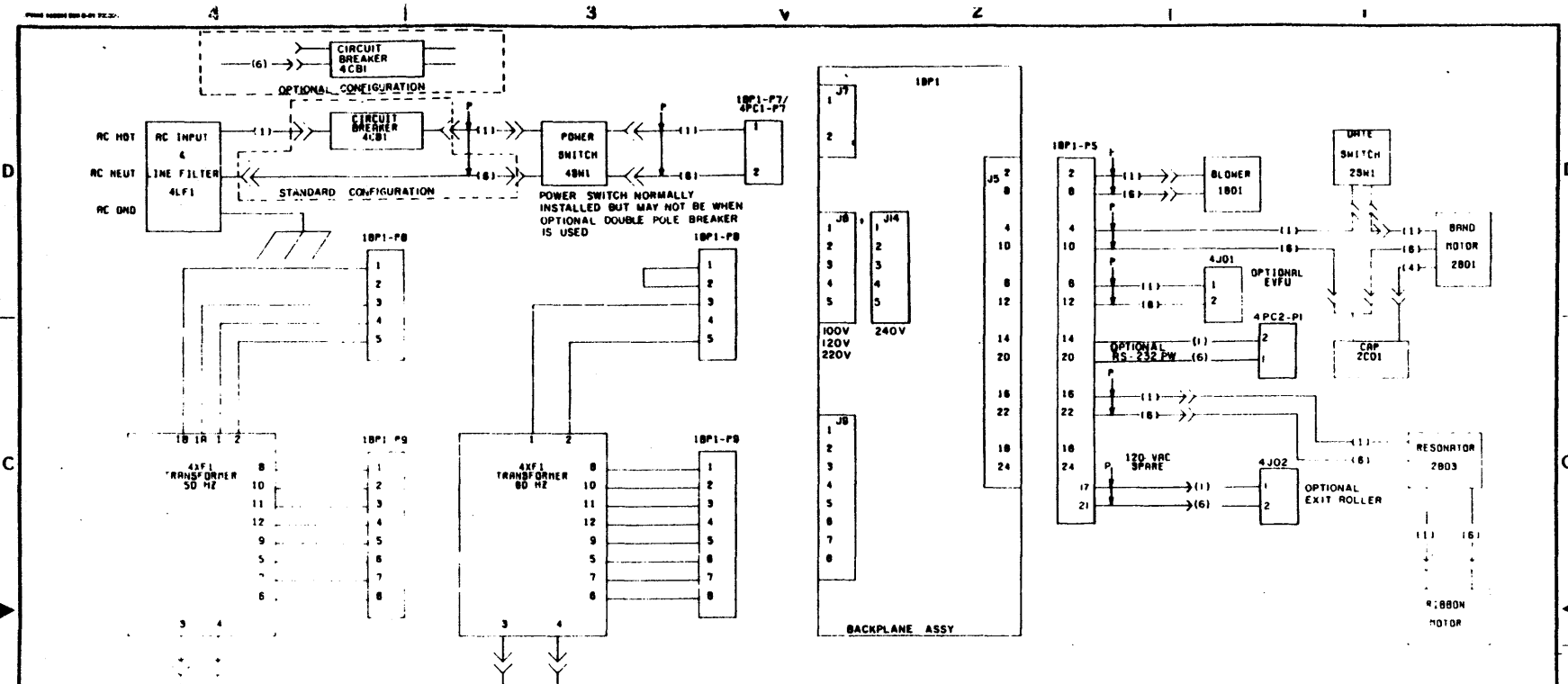
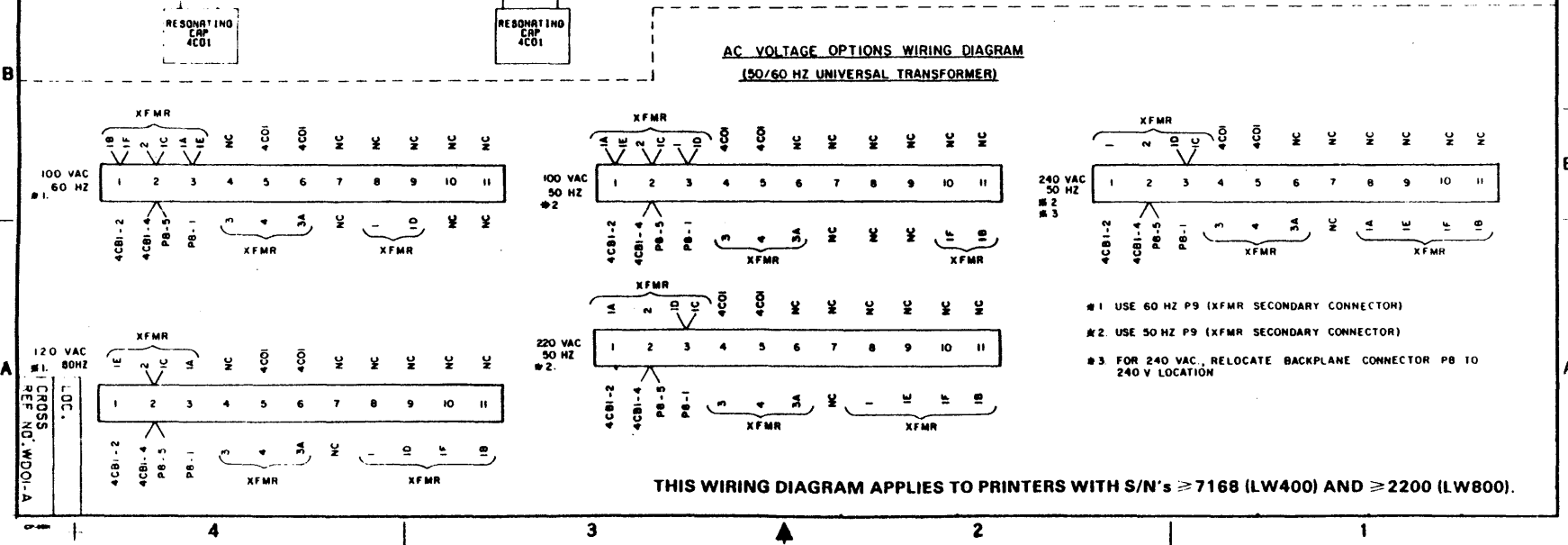


FIGURE 4-1. AC WIRING DIAGRAM (EARLY UNITS)

THIS WIRING DIAGRAM APPLIES TO PRINTERS PRIOR TO S/N 7168 (LW400) AND S/N 2200 (LW800)



AC VOLTAGE OPTIONS WIRING DIAGRAM (50/60 HZ UNIVERSAL TRANSFORMER)



THIS WIRING DIAGRAM APPLIES TO PRINTERS WITH S/N's ≥ 7168 (LW400) AND ≥ 2200 (LW800).

FIGURE 4-2. AC WIRING DIAGRAM

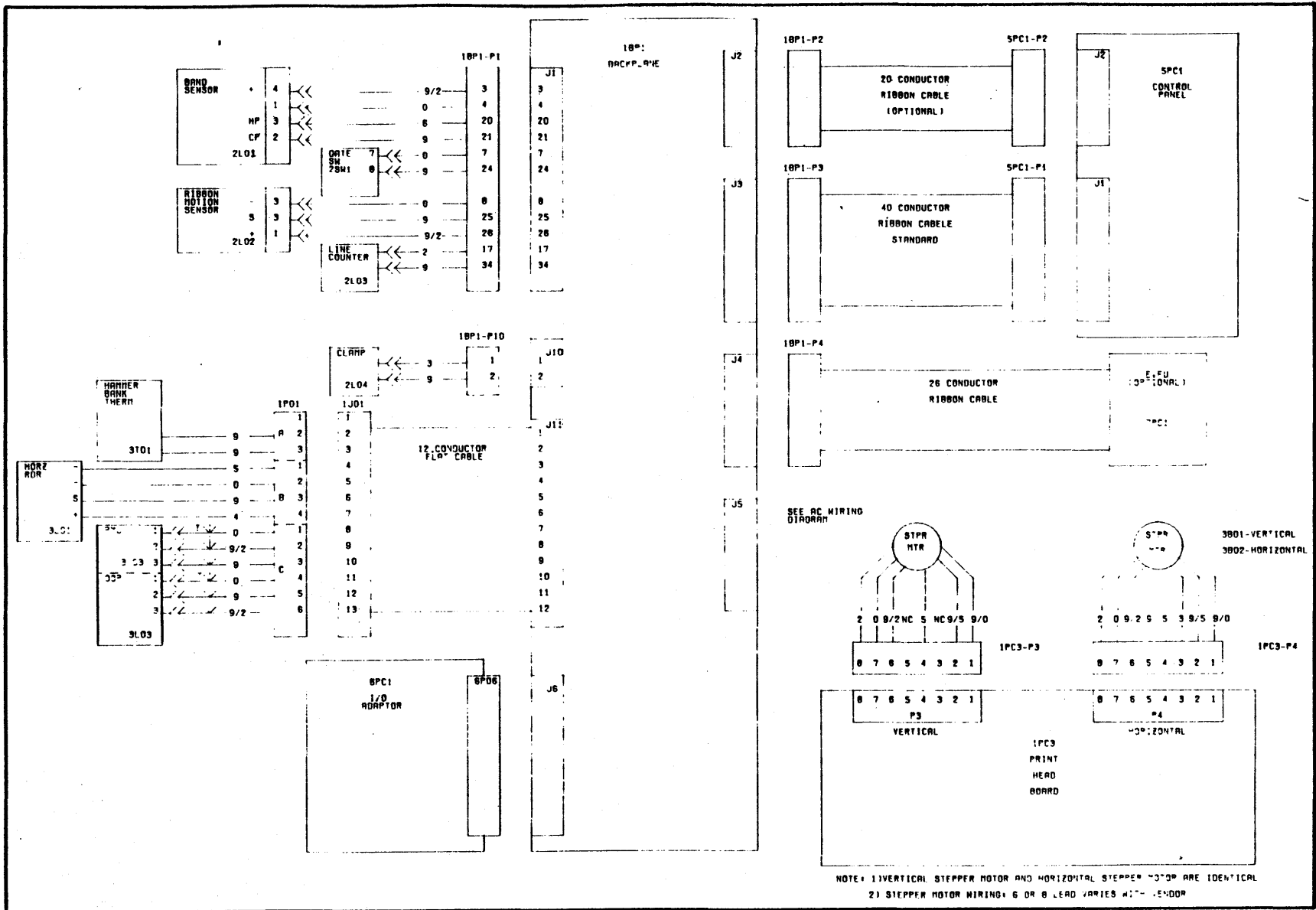


FIGURE 4-3. DC WIRING DIAGRAM

SECTION V PERSONALITY MODULES

DATA PRODUCTS COMPATIBLE PERSONALITY MODULE

There are switch networks on the personality module which are available to the Customer Engineer that affect the printer's operation. See the Maintenance Manual (Section II) for switch locations.

Switch Functions

Space Code switches: There are 8 DIP switches provided for space code selection. When the code selected by these switches is sent from the data source, the personality module replaces the code sent with a blank code (normally 20 hex).

Paper Instruction Disable switch: This switch when active, disables the paper instruction signal on the personality module.

Data Bit 8 Disable switch: This switch when active, disables the data bit 8 signal on the personality module.

Low True switch: This switch when active inverts the following signals on the personality module to active low logic levels.

- a. Demand
- b. Ready
- c. On Line
- d. Ident 0 and Ident 1
- e. VFU RDY
- f. BOF
- g. TOF
- h. Data Bits 1 thru 8
- i. Paper Instruction
- j. Strobe
- k. Parity Bit
- l. Parity Error

EVFU Verify switch: This switch when active, indicates to the data source that the printer has EVFU capability.

Buffer Clear Low True switch: This switch when active, inverts the buffer clear signal on the personality card.

Half Line Feed Enable switch: This switch when active allows the personality module to recognize the Half Line Feed code (11 hex) as a valid Paper Motion Control code.

Vertical Tab Enable switch: This switch when active allows the personality module to recognize the Vertical Tab code (0B hex) as a valid paper motion control code.

Control Code Enable switch: This switch when active, allows the personality module to recognize the codes 0A(hex), 0B(hex), 0C(hex), 11(hex) and 0D(hex) (Line Feed (LF), Vertical Tab (VT), Form Feed (FF), Half Line Feed (DC1) and Carriage Return (CR) respectively) as paper motion control codes. When this switch is inactive, the personality module will terminate a print line buffer (PLB) load only with vertical format commands and the 0A(hex), 0B(hex), 0C(hex), 11(hex) and 0D(hex) codes are treated as print data and stored in the PLB.

63 Line Count Enable switch: This switch when active, disables the 6 bit line counter option and places the printer in a 4 bit line counter mode. When the switch is inactive the printer is in a 6 bit line counter option.

Enable Character Translate switches: These switches when active, allow characters from the data source to be translated by the translator ROM's. When a switch is active and a print band with the corresponding character set is installed, the character codes from the data source will be translated by the ROM's before being stored in the PLB. The switches can be configured in any combination.

VFU RDY Select switch: This switch when active initiates a software generated VFU RDY signal approximately three milliseconds after a Stop DAVFU Load code. When the switch is inactive, a hardware initiated VFU signal is generated immediately following the trailing edge of the Data Strobe signal. The EVFU data must be valid for the VFU RDY signal to occur.

Parity Enable switch: This switch when active, allows the personality module to detect parity errors.

Latch or Byte Parity Select switch: In order for this switch to function, the Parity Enable switch must be active. The On position checks each line (latch mode) for parity, the Off position checks each byte (or each character) for parity.

When latched parity mode is enabled, the print buffer is loaded and latches if and when a parity error occurs until the line gets terminated with a valid line termination code. After the line is terminated successfully, the contents of the print buffer is printed and parity errors will be printed as blanks if the Space Code Parity Select switch has been enabled. The Parity Error status will be dropped before any new data is sent and the cycle is repeated.

When byte parity mode is selected, parity error status follows every byte (or character) of input data separately. Upon detection of a parity error, a blank code can be printed for every code with bad parity if the Space Code Parity Select switch has been enabled.

In both Latch and Byte parity modes if a parity error is detected during a DAVFU start or end load code or during a DAVFU data load, an improperly loaded DAVFU buffer will result. The data source should try to reload the DAVFU without parity errors. The DAVFU buffer can be cleared with a Buffer Clear signal.

If a parity error is detected during a format control code (LF, VT, FF, DC1 or CR) the line of print data will not be terminated until the data source terminates the line correctly or retransmits the line after sending a Buffer Clear signal.

Odd or Even Parity Select switch: In order for this switch to function the Parity Enable switch must be active. When this switch is active all data entering the print buffer (including character codes, control codes and format control codes) will be checked for odd or even parity. The On position checks for odd parity, the Off position checks for even parity.

Space Code Parity Select switch: In order for this switch to function, the Parity Enable switch must be active. When this switch is active a blank code will be substituted for every code in the print buffer with bad parity.

Paper Instruction Parity Enable switch: In order for this switch to function the Parity Enable switch must be active. When this switch is active the paper instruction bit is checked for parity.

INTERFACE CHARACTERISTICS

Transmitter/Receiver

The printer can have either short line interface or long line interface. Short line interface uses single ended transmitters and receivers, the long line interface uses differential transmitters and receivers.

Short Line Interface: The transmitters and receivers have a drive capability of up to 50 feet (15.3 meters). Figure 5-1 shows a typical transmitter and receiver and the recommended cable characteristics. When this recommended configuration is used, the line voltages will be as follows:

Logic "1" = $3.25 \pm 0.5V$ (True or Active Level)
Logic "0" = $0.2 \pm 0.2V$ (False or Inactive Level)

Long Line Interface: The transmitters and receivers used on the long line interface have a drive capability of up to 500 feet (152.4 meters). Figure 5-2 shows a typical transmitter and receiver, and the recommended cable characteristics. The signal is active when the (+) line is a higher voltage than the (-) line. The signal is inactive when the (-) line is a higher voltage than the (+) line. The long line interface components are mounted on the I/O connector board.

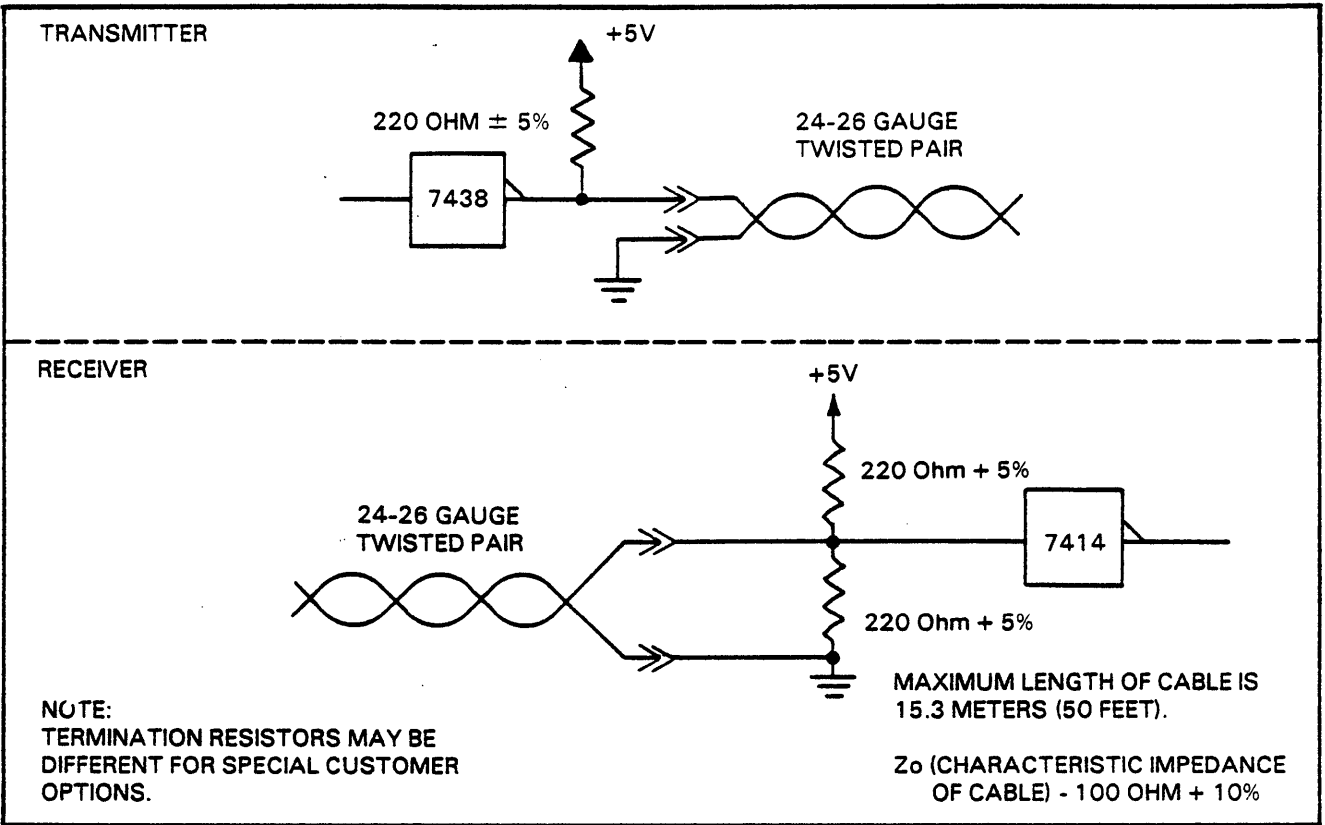


FIGURE 5-1. STANDARD TRANSMITTERS AND RECEIVERS FOR SHORT LINE INTERFACE

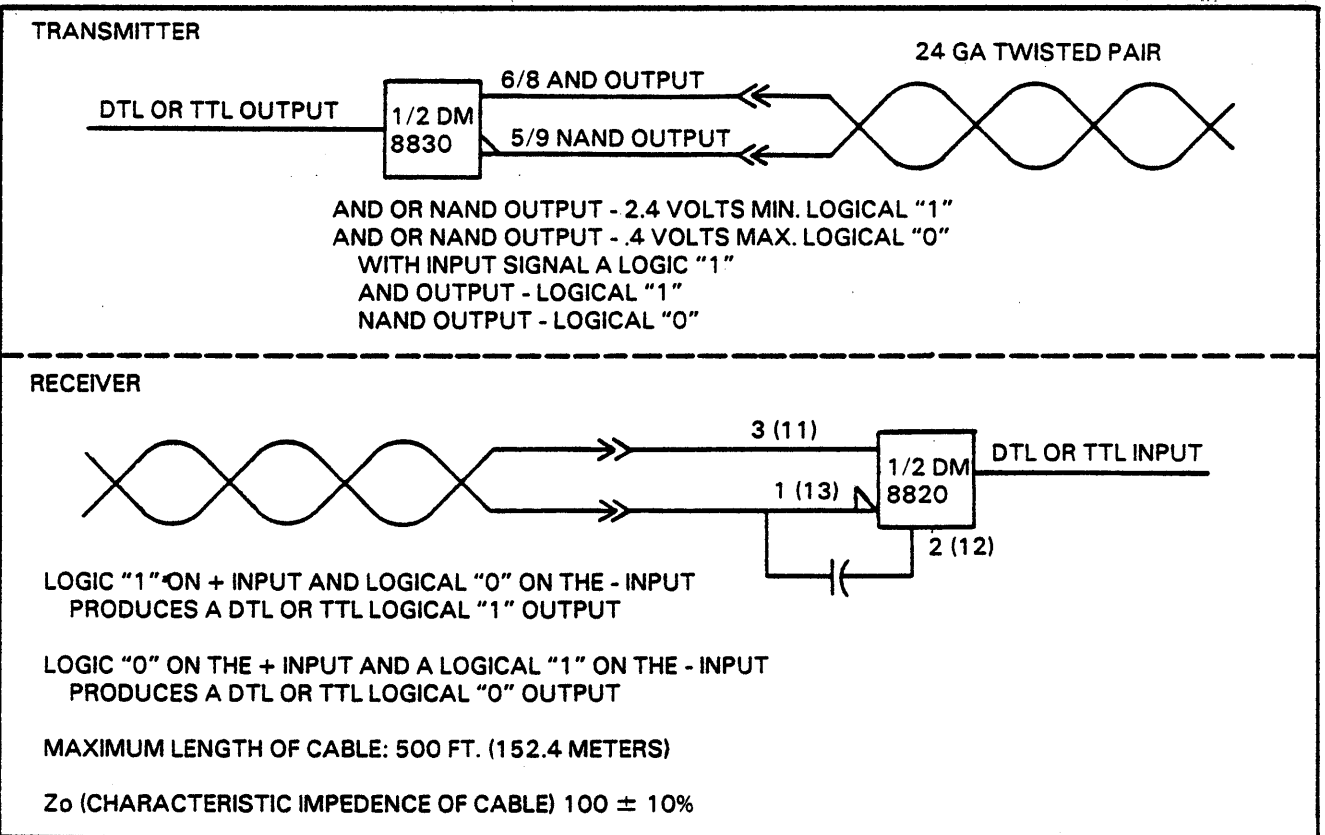


FIGURE 5-2. OPTIONAL TRANSMITTERS AND RECEIVERS FOR LONG LINE INTERFACE

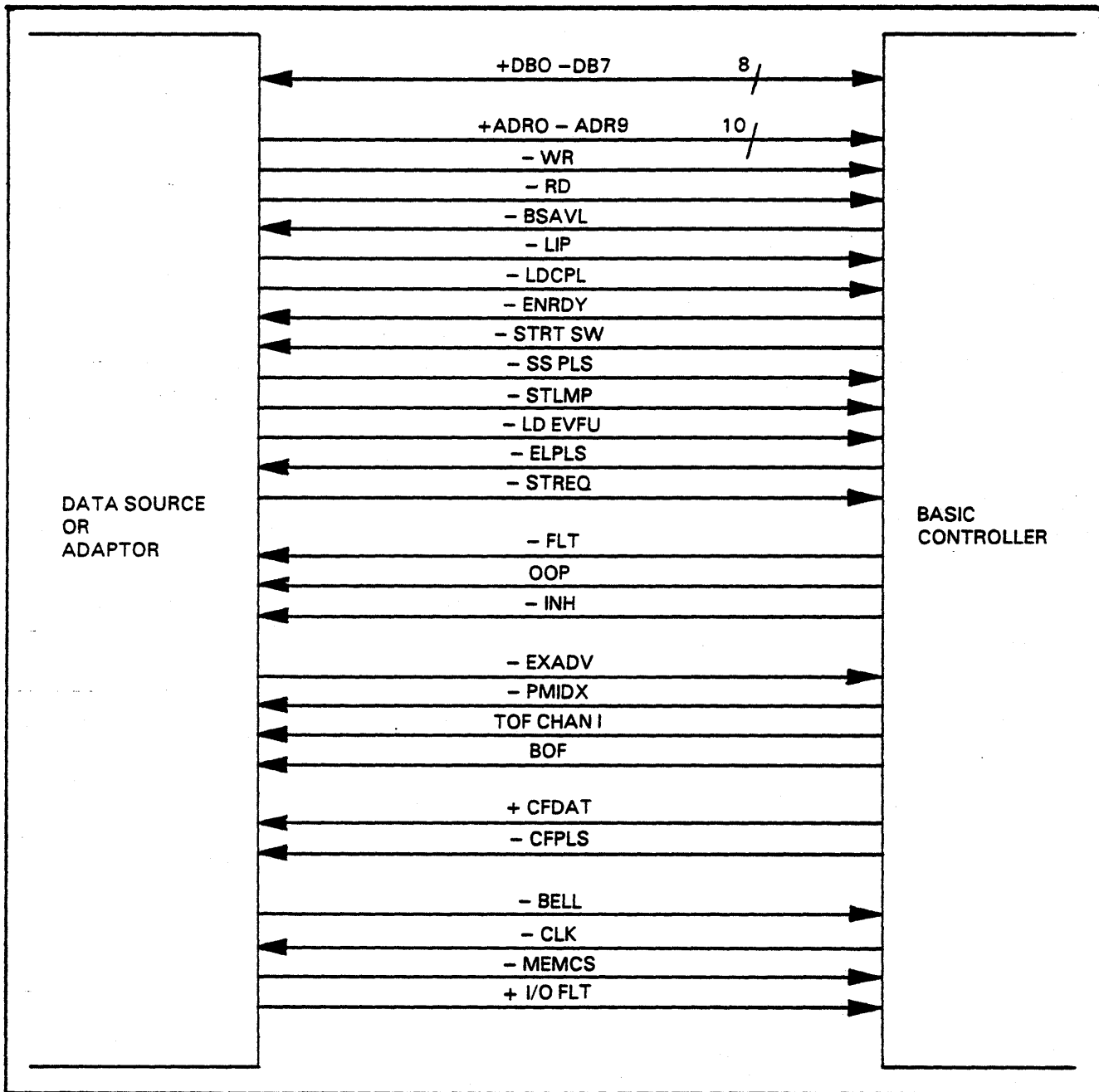


FIGURE 5-3. STANDARD BUS

INTERFACE SIGNALS (See Figure 5-4)

The minus sign before a signal name indicates the actual signal line has a negated logical sense being active when logical "0". A plus indicates positive logical sense being active when at a logical "1". Tables 5-4 thru 5-7 show connector pin assignments. Figure 5-5 shows timing relationships. Figure 5-4 shows data source to printer interface lines.

Ready

A signal from the printer which when active (logic 1) indicates that no faults exist within the printer, paper is loaded and the printer is ready to be placed On Line.

On Line

A signal from the printer which, when active (logic 1) indicates to the data source that the printer has been placed On Line. When On Line is active, the following conditions exist:

- a. The printer is READY.
- b. The START switch has been activated and the controller has responded by making (-)ENRDY active. On Line remains active if (-)ENRDY goes inactive and print line buffer (PLB) load is in progress.

Demand

A signal from the printer which is used to synchronize data transfer from the data source to the personality module. If the printer is On Line, the Demand line will go active to request a character from the data source. Demand will then drop. When Demand has dropped, the Data Strobe may be dropped. Note that another Demand will not be generated until Data Strobe has dropped. See Figure 5-5 for timing details.

Data Strobe

A signal from the data source to the printer which indicates that a data character has been placed on the data lines. When a Data Strobe occurs, the printer samples the data lines and brings the Demand line inactive.

Data 1 Thru 8 and Paper Instruction

These are signal lines from the data source to the printer which carry the codes for print data and forms motion commands. Data on these lines must be stable for at least 50ns prior to and after the Data Strobe. See Figure 5-5 for timing details.

Ident 0 and Ident 1

Two signal lines from the printer to the data source contain binary coded information which identifies the type of band currently on the printer. Ident 0 and Ident 1 are valid only when On Line is active.

IDENT I	IDENT 0	TYPE OF BAND
0	0	128 Character
0	1	96 Character
1	0	64 Character
1	1	48 Character

-Buffer Clear

A signal from the data source (logic 0) to the printer that resets the print line buffer to column one if a forms motion command has not yet been received. (-)Buffer Clear has no effect after a forms motion command has been received. During transfer of DAVFU tape data only, (-)Buffer Clear may be used to clear the DAVFU buffer. (-)Buffer Clear must be active for a minimum of ten microseconds.

Bottom of Forms (BOF)

This is a status line which is active (logic 1) when the forms are at the Bottom of Forms position. The line goes active when the form moves to the Bottom of Forms position, and goes inactive when it leaves this position. In non EVFU machines, Bottom of Forms is defined as being 3,4,5, or 6 lines (defined by DIP switches on the CPU board) before the Top of Forms position for either the Fixed Forms Length or the Selectable Forms Length Control Mode.

When the EVFU option is loaded, the Bottom of Forms location is defined by either Channel 2, 8, 12, or no BOF by use of DIP switches on the CPU board.

Top of Forms (TOF)

This is a status line which is active (logic "1") when the forms are at the Top Of Forms position. The line goes active when the form moves to the Top Of Forms position, and goes inactive when it leaves this position. The Top of Forms location is defined by a counter in Forms Length Control mode, or by Channel 1 when the EVFU is loaded.

VFU RDY

This is a status line to the data source that when active indicates that the VFU is ready. This signal goes inactive when a start DAVFU load code is sent by the data source. VFU RDY then goes active after a stop DAVFU load code is sent by the data source, and the EVFU data has been verified to be valid.

Interface Verify

This allows the data source to verify that the I/O connector has been attached by jumpering pins 46 and 45 on the I/O connector together on the personality module.

EVFU Installed and EVFU Verify

In order to allow the data source to verify that the printer has an EVFU capability, the EVFU verify switch on the personality module must be closed.

Parity Input

This is a signal line from the data source to the printer that will make the right parity sum (odd or even) for each character on the data lines.

Parity Error

This is a signal line from the printer that will go active when a parity error is detected. The Parity signal is only valid during a data transfer cycle and 20 microseconds after the last data byte is received.

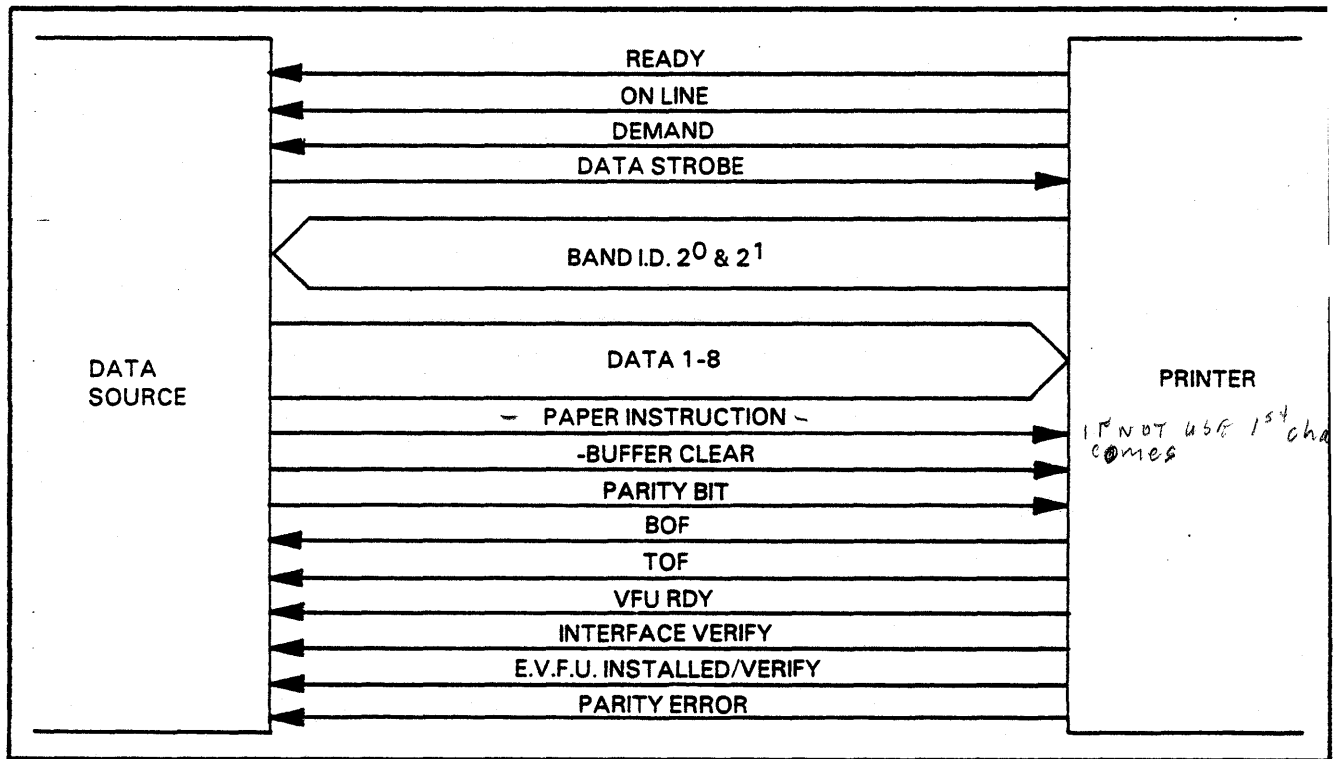


FIGURE 5-4. DATA SOURCE TO PRINTER INTERFACE LINES

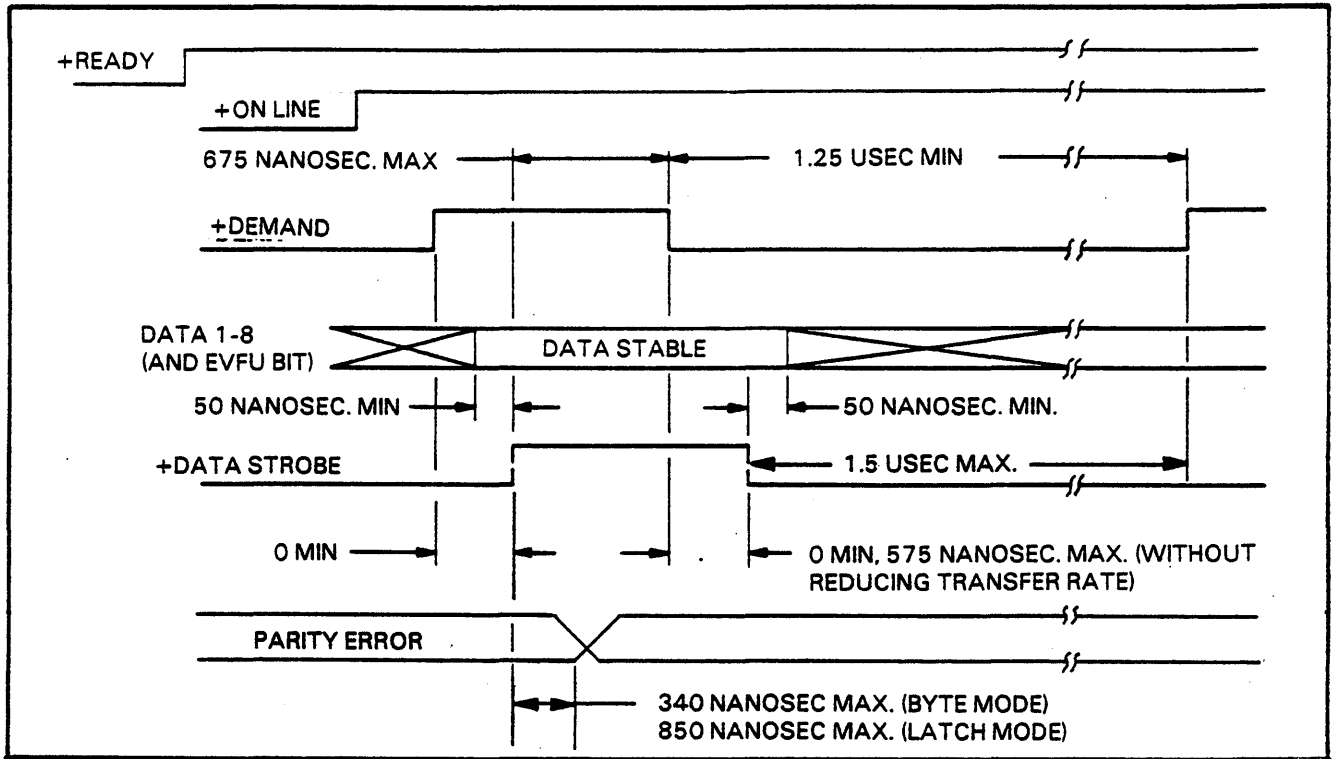


FIGURE 5-5. INTERFACE TIMING

DATA INTERCHANGE TECHNIQUE

Three different types of information can be sent to the printer from the data source using the data lines and vertical format lines. The types of information are:

- a. Print data for a line of print
- b. Forms motion commands
- c. DAVFU data

Print Data for a Line of Print (See Table 5-1)

When the personality module is Ready and has been placed On Line, the personality module will enter the Print Line Buffer load (PLB) mode. In this mode, the first character transferred is stored in the PLB for column one. The second for column two etc., until the Print Line Buffer is full. (Normally 132 characters in standard pitch, but depends on the number of columns and the horizontal pitch). All excess characters are not printed, although the personality module will continue to accept them. No printing will occur until a Forms Motion Command is sent. All print data must be sent with paper instruction signal false (logic 0). See Table 5-1 for print codes.

Forms Motion Commands (see Table 5-2)

Once the PLB load has begun, the personality module will continue to accept print data until a Forms Motion Command is received. Forms Motion Commands are Paper Motion Control codes or Vertical Format Commands. When the paper instruction signal is active, the data on the data lines are interpreted as Vertical Format Commands. When paper instruction is false, the following Paper Motion Control codes will terminate the data transfer:

- a. Line Feed (LF): 0A (Hex)
- b. Form Feed (FF): 0C (Hex)
- c. Carriage Return (CR): 0D (Hex)
- d. Vertical Tab (VT): The 0B (Hex) code causes the data transfer to terminate if the Vertical Tab Enable Switch on the personality module is active.
- e. Half Line Feed (DC1): The 11 (Hex) code causes the data transfer to terminate if the Half Line Feed Enable switch on the personality module is enabled.

DAVFU Data: The DAVFU load may begin when Demand is active and the PLB is not being loaded by sending a start code. After receiving a start code, the personality module will interpret the data on the data lines as VFU information and store the data in the VFU memory on the CPU board. The personality module will continue to accept the VFU data until a stop code is received. If there are any errors in the VFU data, the printer will print the line in the PLB then go Off Line.

The personality module will load the start code, 144 lines (maximum) of VFU data, and the stop code into the VFU memory of the controller board.

Stop Code Only: Stop code only is used to recirculate the DAVFU memory to the first line loaded position.

EVFU Load Errors (see Table 5-3)

If the EVFU data has not been loaded properly (data format error or an overflow error), the printer will be placed in an Off Line condition. A data format error is defined as a Stop code having been loaded into an odd byte location. An Overflow error is defined as an EVFU load greater than 144 lines.

TABLE 5-2. FORMS MOTION COMMANDS

VERTICAL FORMAT	DATA BITS								
	8	7	6	5	4	3	2	1	
1	X	X	X	1	0	0	0	0	SUPPRESS SPACE
1	X	X	X	1	0	0	0	1	SINGLE SPACE
1	X	X	X	1	0	0	1	0	DOUBLE SPACE
1	X	X	X	1	1	1	1	0	14 SPACE
1	X	X	X	1	1	1	1	1	15 SPACE
1	X	X	X	0	0	0	0	0	ADVANCE TO CHANNEL 1
1	X	X	X	0	0	0	0	1	ADVANCE TO CHANNEL 2
1	X	X	X	0	0	0	1	0	ADVANCE TO CHANNEL 3
1	X	X	X	0	1	0	1	0	ADVANCE TO CHANNEL 11
1	X	X	X	0	1	0	1	1	ADVANCE TO CHANNEL 12
1	X	X	X	0	1	1	0	0	ILLEGAL COMMAND
1	X	X	X	0	1	1	0	1	ILLEGAL COMMAND
1	X	X	X	0	1	1	1	0	ILLEGAL COMMAND
1	X	X	X	0	1	1	1	1	ILLEGAL COMMAND
DAVFU MODE ONLY									
1	0	1	1	0	1	1	1	0	START DAVFU LOAD (WON'T TERMINATE LINE)
1	0	1	1	0	1	1	1	1	END DAVFU LOAD
X	X	X	C ₆	C ₅	C ₄	C ₃	C ₂	C ₁	ODD TAPE DATA WORD } ONE FORM LINE
X	X	X	C ₁₂	C ₁₁	C ₁₀	C ₉	C ₈	C ₇		EVEN TAPE DATA WORD }
0	0	0	0	0	1	0	1	0	LF (LINE FEED) ASCII CONTROL CODE
0	0	0	0	0	1	1	0	0	FF (FORM FEED) ASCII CONTROL CODE
0	0	0	0	0	1	1	0	1	CR (CARRIAGE RETURN) ASCII CONTROL CODE
0	0	0	0	0	1	0	1	1	VT (VERTICAL TAB) ASCII CONTROL CODE
0	0	0	0	1	0	0	0	1	DC1 (HALF LINE FEED) ASCII CONTROL CODE

NOTES:



PRINTER WILL GO TO "STOP" MODE AND DISPLAY ILCH (ILLEGAL CHANNEL SELECTED).



CODE 6E (HEX) WILL DEFAULT TO THE 6/8 LPI SWITCH, CODE 6C (HEX) WILL SET THE PRINTER TO 6 LPI, CODE 6D (HEX) WILL SET THE PRINTER TO 8 LPI.



BIT 5 IS USED AS THE SELECT BIT FOR LINE COUNTER VERSUS CHANNEL SELECT CODES.

WHEN THE 63 LINE COUNT DISABLE SWITCH ON THE PERSONALITY MODULE IS IN THE INACTIVE POSITION, BITS 6 AND 7 ARE USED AS THE MOST SIGNIFICANT BITS.

WITH THE FORMAT OF ODD AND EVEN TAPE DATA WORDS AS SHOWN, IT IS POSSIBLE TO GENERATE AN INVALID END DAVFU LOAD. IT IS UNDESIRABLE THEN TO USE 2F (HEX) FOR A VALID TAPE DATA WORD (DATA BITS 7 AND 8 AND PAPER INSTRUCTION ARE DON'T CARE BITS).

X= DON'T CARE BIT.

TABLE 5-3. TAPE LOAD EXAMPLE

EQUIVALENT EVFU TAPE												FORM ROW NUMBER	VERTICAL FORMAT	DATA LINES								1									
1	2	3	4	5	6	7	8	9	10	11	12			8	7	6	5	4	3	2	1		2								
														START LOAD	1	0	1	1	0	1	1			1	0						
1	ODD	X	X	1	0	0	1	0	0			X	X	1	0	0	1	0	0												
	EVEN	X	X	1	0	0	0	0	0			X	X	1	0	0	0	0	0												
2	ODD	X	X	0	0	0	0	0	0			X	X	0	0	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0			X	X	0	0	0	0	0	0												
3	ODD	X	X	0	0	0	0	0	0		1	X	X	0	0	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
4	ODD	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
5	ODD	X	X	0	1	0	0	0	0		0	X	X	0	1	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
6	ODD	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
7	ODD	X	X	0	0	0	1	1	1		0	X	X	0	1	1	1	1	0												
	EVEN	X	X	0	1	1	1	1	1		0	X	X	0	1	1	1	1	0												
8	ODD	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
9	ODD	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
10	ODD	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
	EVEN	X	X	0	0	0	0	0	0		0	X	X	0	0	0	0	0	0												
	END LOAD	1	0	1	1	0	1	1	1	1	1																				



Code 6E (Hex) will default to the 6-8 LPI switch, Code 6C (Hex) will set the Printer to 6 LPI, Code 6D (Hex) will set the Printer to 8 LPI.



With the format of odd and even tape data words as shown, it is possible to generate an invalid end DAVFU load. It is undesirable then to use 2F (Hex) for a valid tape data word (Data Bits 7 and 8 and Paper Instruction are don't care bits).



Actual load of this data will indicate forms length of less than 3 inches.

X= Don't Care Bit

INTERFACE CONNECTORS

Standard Interface Connector

The standard connector provided with the printer is an AMP 50 pin connector, AMP part number 745646-1. The connector is shown in Figure 5-6. Tables 5-4 and 5-5 show the interface signals and their associated connector pin assignments. No data cable or mating connector is provided with the printer.

Optional Interface Connector

The optional connector is an AMP Type M Series Connector, AMP part number 200277-2. The connector is plug compatible with the Winchester 50 pin MRAC 50 SJ connector. The connector and its associated hardware are shown in Figure 5-7. Tables 5-6 and 5-7 show the interface signals and their associated connector pin assignments. No data cable or mating connector is provided with the printer.

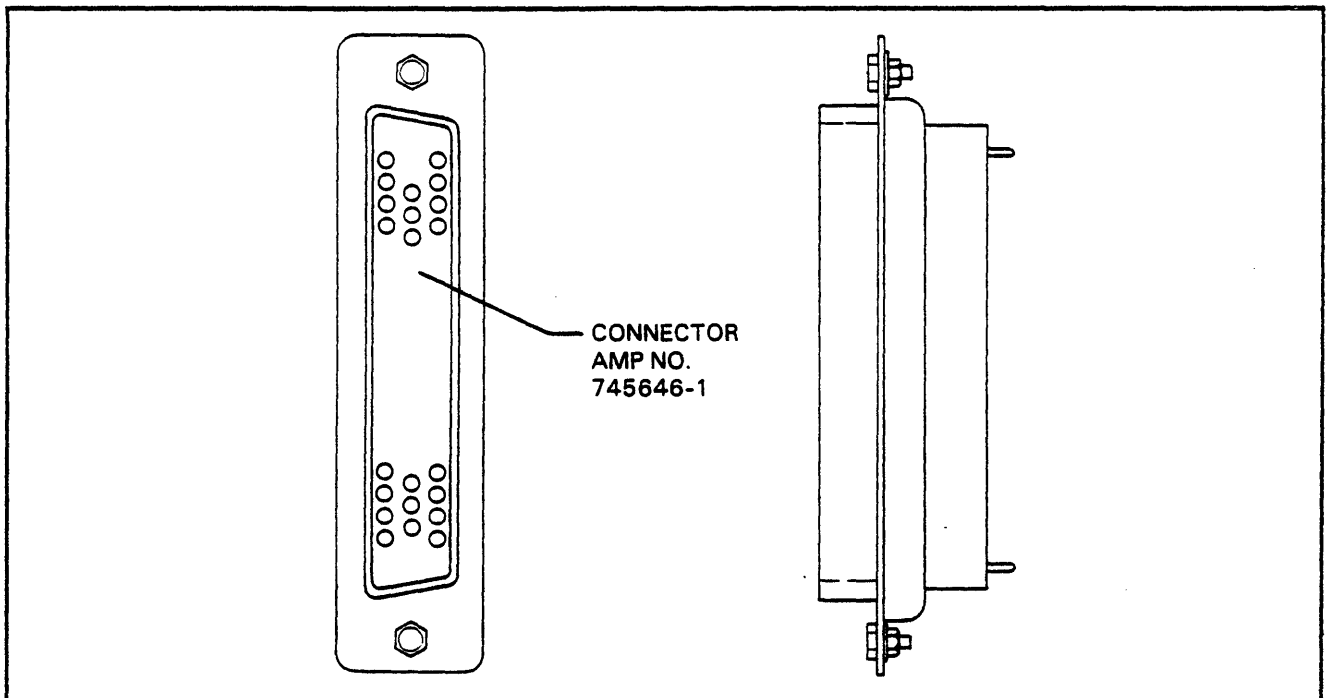


FIGURE 5-6. D-TYPE I/O CONNECTOR CONFIGURATION

TABLE 5-4. D-TYPE I/O CONNECTOR PIN ASSIGNMENTS (SHORT LINE)

<u>PIN NO.</u>	<u>SIGNAL</u>	<u>PIN NO.</u>	<u>SIGNAL</u>
22	+READY	46	+INTERFACE VERIFY
6	-READY RETURN	45	INTERFACE VERIFY RETURN
21	+ON LINE	24	+TOP OF FORM
5	ON LINE RETURN	8	TOP OF FORM RETURN
23	+DEMAND	25	+BOTTOM OF FORM
7	DEMAND RETURN	9	BOTTOM OF FORM RETURN
38	+DATA STROBE	47	+EVFU INSTALLED
37	DATA STROBE RETURN	33	EVFU VERIFY
19	+DATA 1	50	+IDENT 0
3	DATA 1 RETURN	32	IDENT 0 RETURN
20	+DATA 2	49	+IDENT 1
4	DATA 2 RETURN	16	IDENT 1 RETURN
1	+DATA 3	31	-BUFFER CLEAR
2	DATA 3 RETURN	15	BUFFER CLEAR RETURN
41	+DATA 4	12	+5 VOLT (TEST ONLY)
40	DATA 4 RETURN	39	5 VOLT (TEST ONLY) RETURN
34	+DATA 5	26 + 48	+VFU RDY
18	DATA 5 RETURN	10 + 17	VFU RDY RETURN
43	+DATA 6	30	+PAPER INSTRUCTION
42	DATA 6 RETURN	14	PAPER INSTRUCTION RETURN
36	+DATA 7	27	+PARITY ERROR
35	DATA 7 RETURN	11	PARITY ERROR RETURN
28	+DATA 8	29	+PARITY BIT
44	DATA 8 RETURN	13	PARITY BIT RETURN

TABLE 5-5. D-TYPE I/O CONNECTOR PIN ASSIGNMENTS (LONG LINE)

<u>PIN NO.</u>	<u>SIGNAL</u>	<u>PIN NO.</u>	<u>SIGNAL</u>
22	+READY	46	+INTERFACE VERIFY
6	-READY	45	-INTERFACE VERIFY
21	+ON LINE	24	+TOP OF FORM
5	-ON LINE	8	-TOP OF FORM
23	+DEMAND	25	+BOTTOM OF FORM
7	-DEMAND	9	-BOTTOM OF FORM
38	+DATA STROBE	47	+EVFU INSTALLED
37	-DATA STROBE	33	-EVFU VERIFY
19	+DATA 1	50	+IDENT 0
3	-DATA 1	32	-IDENT 0
20	+DATA 2	49	+IDENT 1
4	-DATA 2	16	-IDENT 1
1	+DATA 3	31	-BUFFER CLEAR
2	-DATA 3	15	+BUFFER CLEAR
41	+DATA 4	12	+5 VOLT (TEST ONLY)
40	-DATA 4	39	-5 VOLT (TEST ONLY)
34	+DATA 5	26 + 48	+VFU RDY
18	-DATA 5	10 + 17	-VFU RDY
43	+DATA 6	30	+PAPER INSTRUCTION
42	-DATA 6	14	-PAPER INSTRUCTION
36	+DATA 7	27	+PARITY ERROR
35	-DATA 7	11	-PARITY ERROR
28	+DATA 8	29	+PARITY BIT
44	-DATA 8	13	-PARITY BIT

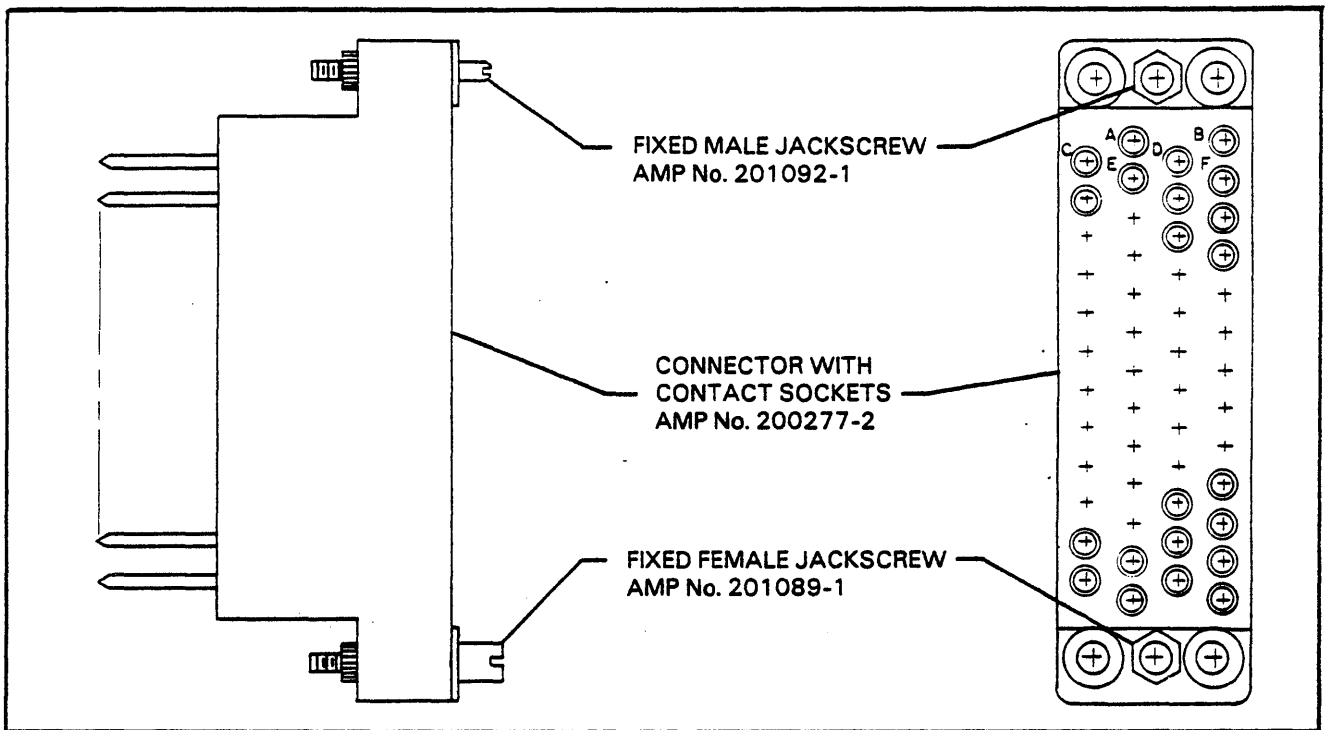


FIGURE 5-7. WINCHESTER TYPE I/O CONNECTOR CONFIGURATION

TABLE 5-6. WINCHESTER TYPE I/O CONNECTOR PIN ASSIGNMENTS (SHORT LINE)

<u>PIN NO.</u>	<u>SIGNAL</u>	<u>PIN NO.</u>	<u>SIGNAL</u>
CC	+READY	v	+INTERFACE VERIFY
EE	READY RETURN	x	INTERFACE VERIFY RETURN
y	+ON LINE	S	+TOP OF FORM
AA	ON LINE RETURN	U	TOP OF FORM RETURN
E	+DEMAND	M	+BOTTOM OF FORM
C	DEMAND RETURN	P	BOTTOM OF FORM RETURN
j	+DATA STROBE	e	+EVFU INSTALLED
m	DATA STROBE RETURN	h	EVFU VERIFY
B	+DATA 1	d	+IDENT 0
D	DATA 1 RETURN	f	IDENT 0 RETURN
F	+DATA 2	a	+IDENT 1
J	DATA 2 RETURN	c	IDENT 1 RETURN
L	+DATA 3	A	-BUFFER CLEAR
N	DATA 3 RETURN	H	+BUFFER CLEAR RETURN
R	+DATA 4	HH	+5V (TEST ONLY)
T	DATA 4 RETURN	K	5V (TEST ONLY) RETURN
V	+DATA 5	W + FF	+VFU RDY
X	DATA 5 RETURN	Y + DD	VFU RDY RETURN
Z	+DATA 6	p	+PAPER INSTRUCTION
b	DATA 6 RETURN	s	PAPER INSTRUCTION RETURN
n	+DATA 7	r	+PARITY ERROR
k	DATA 7 RETURN	t	PARITY ERROR RETURN
u	+DATA 8	z	+PARITY BIT
w	DATA 8 RETURN	BB	PARITY BIT RETURN

TABLE 5-7. WINCHESTER TYPE I/O CONNECTOR PIN ASSIGNMENTS (LONG LINE)

<u>PIN NO.</u>	<u>SIGNAL</u>	<u>PIN NO.</u>	<u>SIGNAL</u>
CC	+READY	v	+INTERFACE VERIFY
EE	-READY	x	-INTERFACE VERIFY
y	+ON LINE	S	+TOP OF FORM
AA	-ON LINE	U	-TOP OF FORM
E	+DEMAND	M	+BOTTOM OF FORM
C	-DEMAND	P	-BOTTOM OF FORM
j	+DATA STROBE	e	+EVFU INSTALLED
m	-DATA STROBE	h	-EVFU VERIFY
B	+DATA 1	d	+IDENT 0
D	-DATA 1	f	-IDENT 0
F	+DATA 2	a	+IDENT 1
J	-DATA 2	c	-IDENT 1
L	+DATA 3	A	-BUFFER CLEAR
N	-DATA 3	H	+BUFFER CLEAR
R	+DATA 4	HH	+5V (TEST ONLY)
T	-DATA 4	K	-5V (TEST ONLY)
V	+DATA 5	W + FF	+VFU RDY
X	-DATA 5	Y + DD	-VFU RDY
Z	+DATA 6	p	+PAPER INSTRUCTION
b	-DATA 6	s	-PAPER INSTRUCTION
n	+DATA 7	r	+PARITY ERROR
k	-DATA 7	t	-PARITY ERROR
u	+DATA 8	z	+PARITY BIT
w	-DATA 8	BB	-PARITY BIT

CENTRONICS COMPATIBLE PERSONALITY MODULE

There are switch networks on the personality module which are available to the Customer Engineer that affect the printer's operation. See the Maintenance Manual (Section II) for switch locations.

Switch Functions

Space Code switches: These are 8 DIP switches provided for space code selection. When the code selected by these switches is sent from the data source, the personality module replaces the code sent with a blank code (normally 20 hex). Do not use ASCII Control Codes as blank codes.

Data Bit 8 Disable switch: This switch when active, disables the data bit 8 signal on the personality module for applications where it is not used. When OFF the signal is enabled. When ON, the signal is disabled.

Reverse Polarity on Data Strobe signal switch: When OFF, the required input Data Strobe signal must be active LO. When ON, the signal is must be active HI.

Fold Lower Case ASCII to print as Upper Case ASCII: When ON, disables fold-over function. When OFF, the fold-over function is enabled. The fold-over function converts lower case 96 character ASCII codes to upper case 64 character ASCII codes.

96 character ASCII bands would have no need for this function because the band has upper and lower case characters on it. 64 character ASCII bands, however, could use this function as the printer could accept 96 character codes but process them into 64 character codes. This allows the printing of intelligent data without changing the print band.

Enable 7 Bit Line Count: When on, the line skip count VFU command is expanded from 15 to up to 127 lines.

Inhibit the Delete code (7F hex): When ON, the printer will recognize the ASCII DEL (delete) code 7F (hex). When OFF the delete code is not recognized. See Interface Signals for a description of the signal.

Reverse Polarity on the Select signal switch: When ON, the Select signal is inverted. When OFF, the Select signal is not inverted.

Reverse Polarity on Data Bits 1 thru 8: When ON, Data Bits 1 through 8 are inverted. When OFF, Data Bits 1 through 8 are not inverted.

Select Paper Feed Terminate switch: This switch enables the printer to terminate a line of print data upon a LF, FF, or VT paper feed command and initiate a print cycle. When ON, the feature is enabled. When OFF, the feature is disabled.

Buffer Full Terminate switch: When ON, prints a line of print. When OFF, prints a line of print and a LF (Line Feed) code is generated (paper is advanced one (1) line).

Enable Character Translate switches: These switches when active, allow characters from the data source to be translated by the translator ROM's. When a switch is active and a print band with the corresponding character set is installed, the character codes from the data source will be translated by the ROM's before being stored in the PLB (Print Line Buffer). The switches can be configured in any combination.

Select Fault: This switch allows the setting of the Fault I/O status signal when the printer is in the Deselect mode.

Auto Line Feed switch: When ON, the printer will perform a line feed at the completion of a line of print terminated by a Carriage Return (CR) code.

Select Buffer Clear: When ON, the input data buffer will clear (be reset) upon an I/O Deselect operation.

INTERFACE CHARACTERISTICS

Transmitter/Receiver

The printer has single ended transmitters and receivers and is capable of communicating on I/O lines up to 25 feet (7.62 meters) in length. Figure 5-8

shows a typical transmitter and receiver and the recommended cable characteristics. When this recommended configuration is used, the line voltages will be as follows:

Logic "1" = 2.4V to +5.5V (True or Active Level)

Logic "0" = 0.0V to +0.4V (False or Inactive Level)

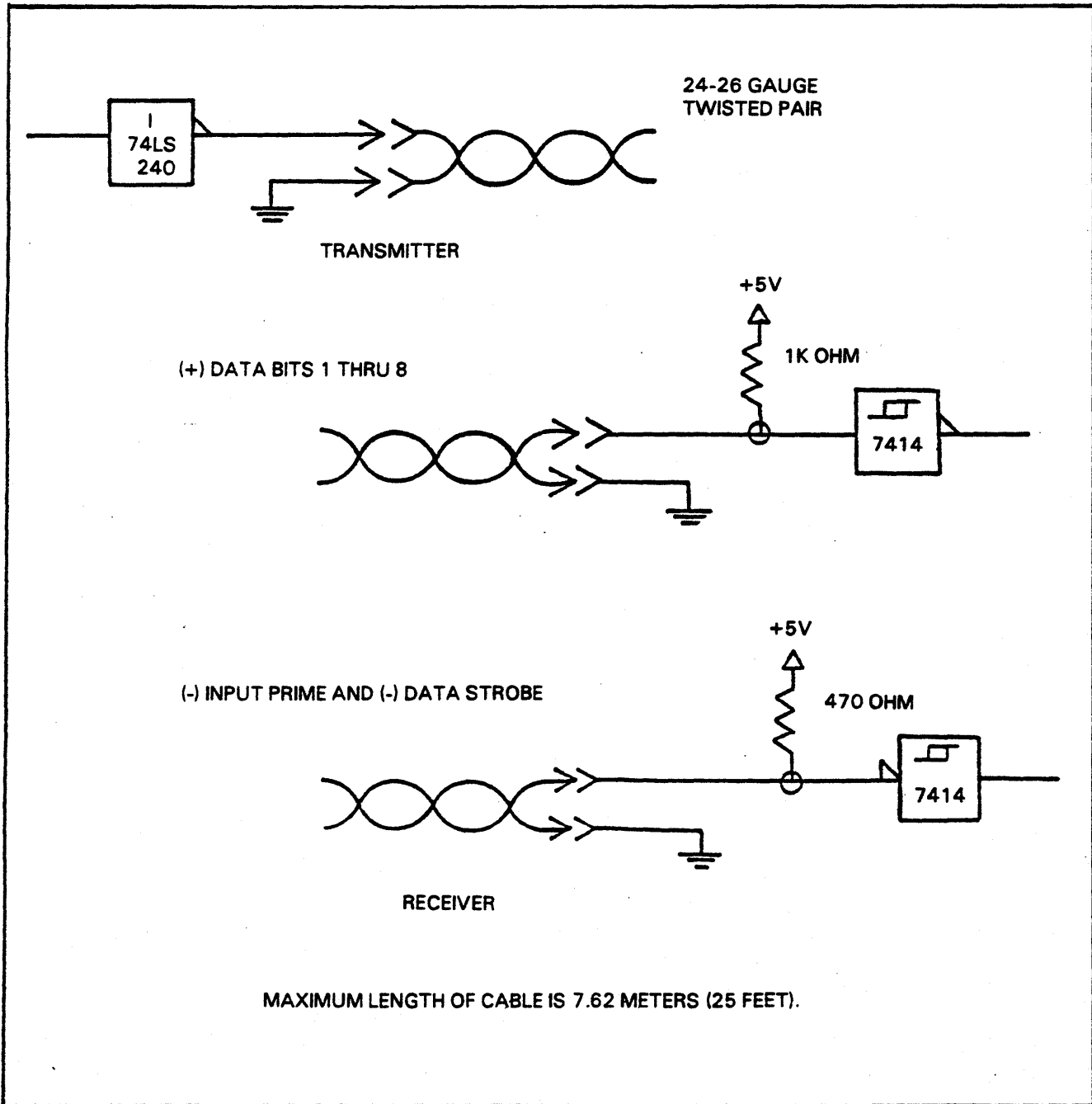


FIGURE 5-8. TRANSMITTERS AND RECEIVERS

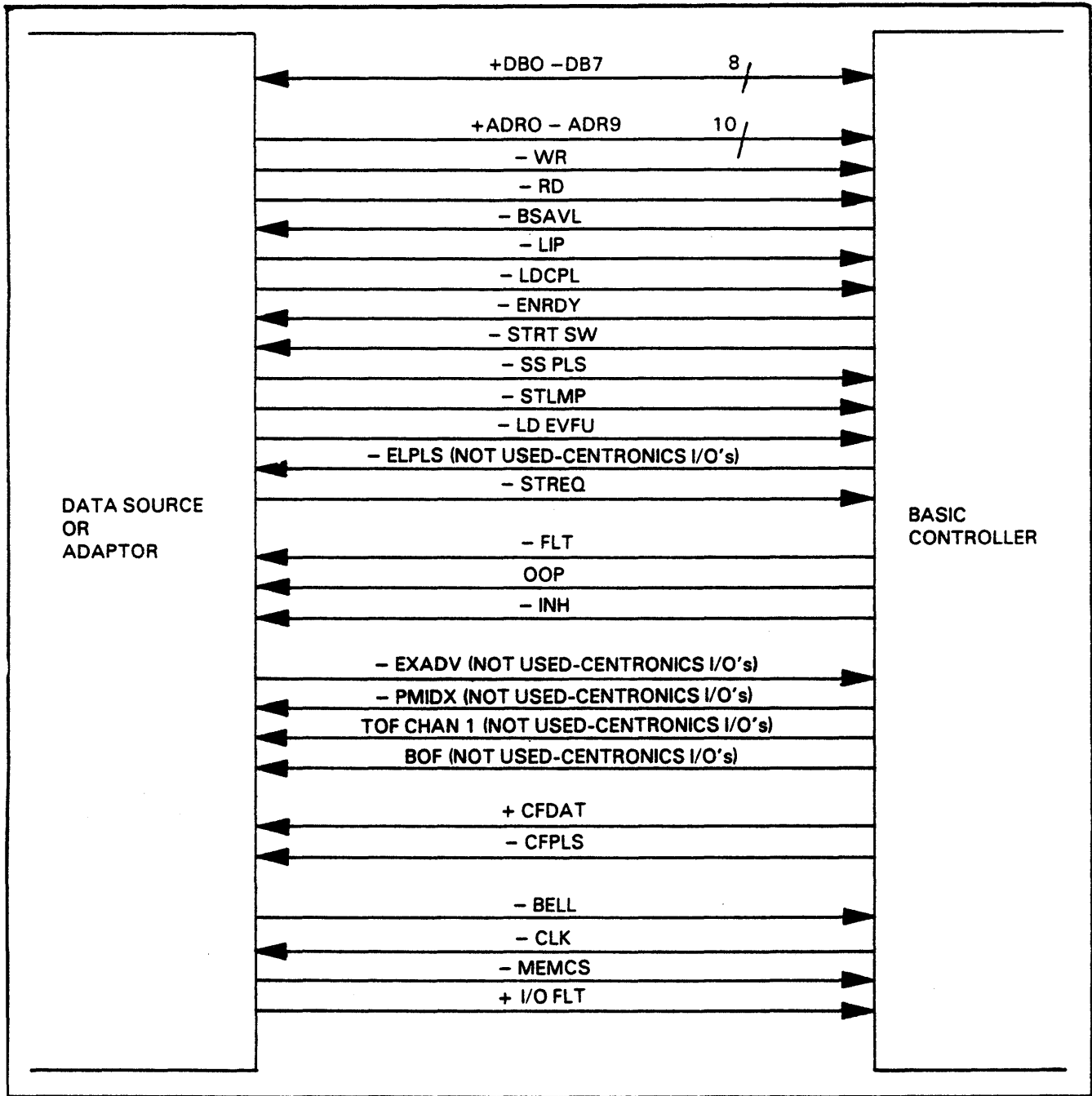


FIGURE 5-9. STANDARD BUS

INTERFACE SIGNALS (See Figure 5-10)

The definitions given below are the interface signals which can be used by the data source. The signal names are preceded by a (+) or a (-) which indicates the assertion or negation respectively. For example: (-) Data Strobe indicates that a Data Strobe condition exists when this signal is at a logic "0". Data and signal timing is measured at the printer interface connector.

(-) Data Strobe (To Printer)

This line when at a logic "0" indicates to the printer that the data lines are stable and may be sampled by the printer. This active low signal is used to synchronize input data with the printer electronics. This signal can be made active high ((+) Data Strobe) by setting a switch on the personality module. See Switch Functions preceding.

(-) Acknowledge (From Printer)

This line when inactive indicates to the data source that a character has been stored, or that a functional operation has been completed. The (-)Acknowledge signal will also be generated at the trailing edge of (+)Busy.

(+) Data Bits (To Printer)

Eight data lines (+DB1 thru +DB8) carry the information (data characters, VFU data, and Control Codes) to the printer. (+)DB8 is optional and is used when the printer is operated with a 128 character set print band. When only seven data bits are required, (+)DB8 is disabled.

The data must be stable on the data lines for a minimum of one microsecond before and after the generation of (-) Data Strobe signal. (See Figure 5-11 for timing).

Optional translator ROM's can be used to translate any 8 or 7 data bit code to the codes needed by the printer for it to function properly.

(-) Input Prime (To Printer)

This line when inactive resets the printer. This includes clearing the print buffer, and terminating any ongoing function.

(+) Busy (From Printer)

This line when active indicates to the data source that the printer is not in a state to receive data. No codes except the Select Code will be accepted while the (+)Busy signal is active. (+)Busy is generated during the execution of the following printer operations:

Printing operation

Any paper motion operation

During the time the printer is powered ON and not selected (in the Stop mode)

When a detectable fault condition exists in the printer

In response to each VFU data character

In response to the following Control Codes:

- a. Del (7F Hex)
- b. Bel (07 Hex)
- c. Select (11 Hex)
- d. VFU Command (1F Hex)
- e. Start IOVFU Load (1D Hex)
- f. Stop IOVFU Load (1E Hex)
- g. Escape (1B Hex)

(+)Select (From Printer)

This signal when active indicates to the data source that no faults exist within the printer, paper is loaded, and the Start switch on the Control Panel has been pressed (or a Select Code has been received) when the printer was previously in a Deselected state. The printer must be Selected before it can process any data. This is the only code accepted by the data source when the printer is in a (+)Busy condition. This signal can be made low ((-) Select) by setting a switch on the personality module. See Switch Functions preceding.

125 KHz Clock (From Printer)

This signal is a 125 ± 2 KHz square wave. This is a free running clock and is always present when DC power is present.

(+)Paper Empty (From Printer)

This signal when active indicates to the data source that some type of paper error has been detected. It could be an out of paper condition or a paper jam condition. A (+)Paper Empty signal will be generated for any of the following out of paper conditions:

Power ON with no paper in machine

When the printer is in the Deselected mode and the paper low switch detects the absence of paper below the print station

When the printer is printing and the paper low switch detects the absence of paper, the printer will continue to accept data and print until the Bottom of Forms (BOF) channel is reached. Upon detection of the BOF channel no more data will be accepted.

Any of the above conditions will cause the printer to generate a (+)Busy and a (-)Fault I/O status and the printer will become Deselected.

(-)Fault (From Printer)

This signal when inactive indicates to the data source that a fault condition exists. A switch selectable option is provided to permit setting the Fault I/O status signal when the printer is in the Deselected mode.

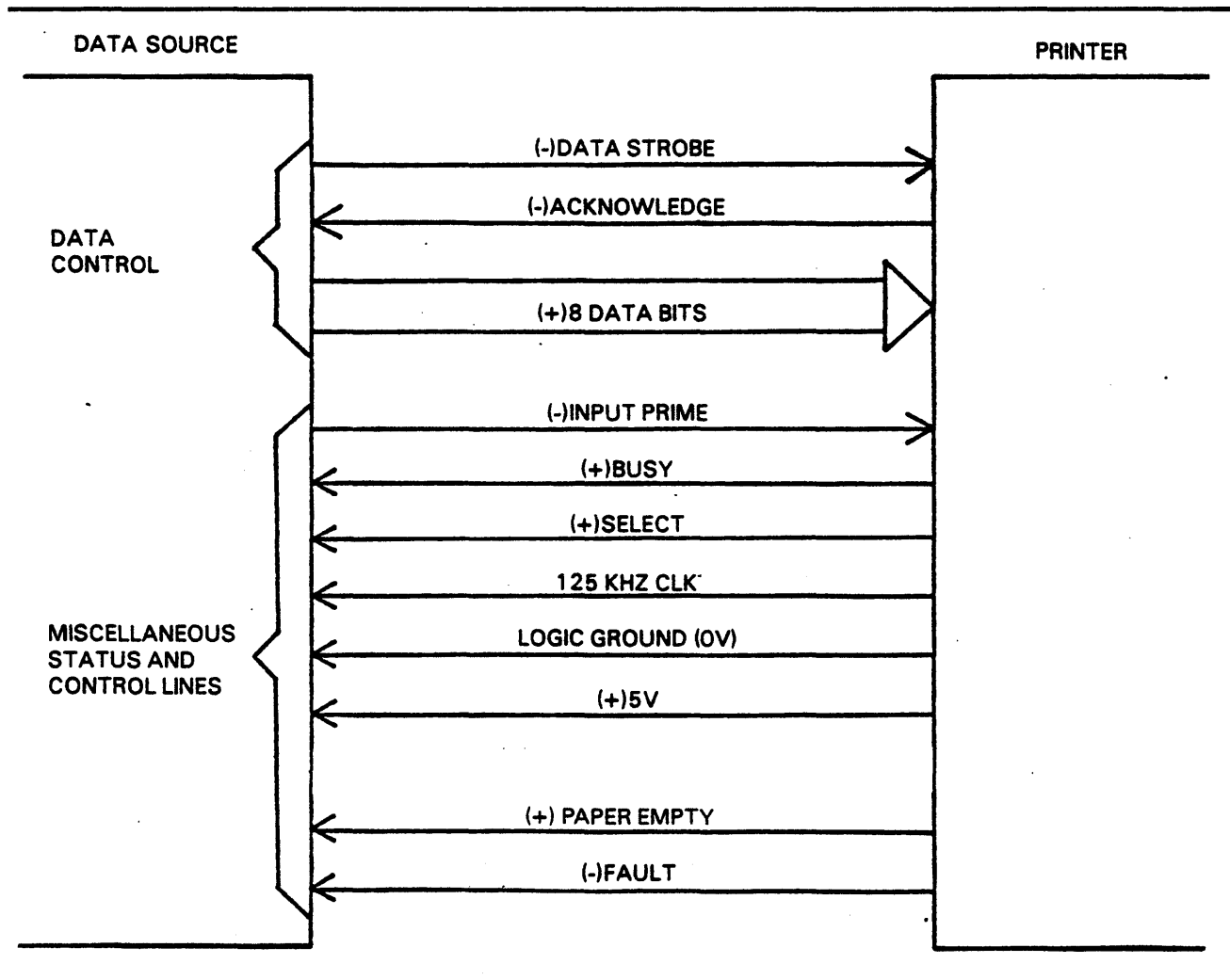


FIGURE 5-10. DATA SOURCE AND PRINTER INTERFACE LINES

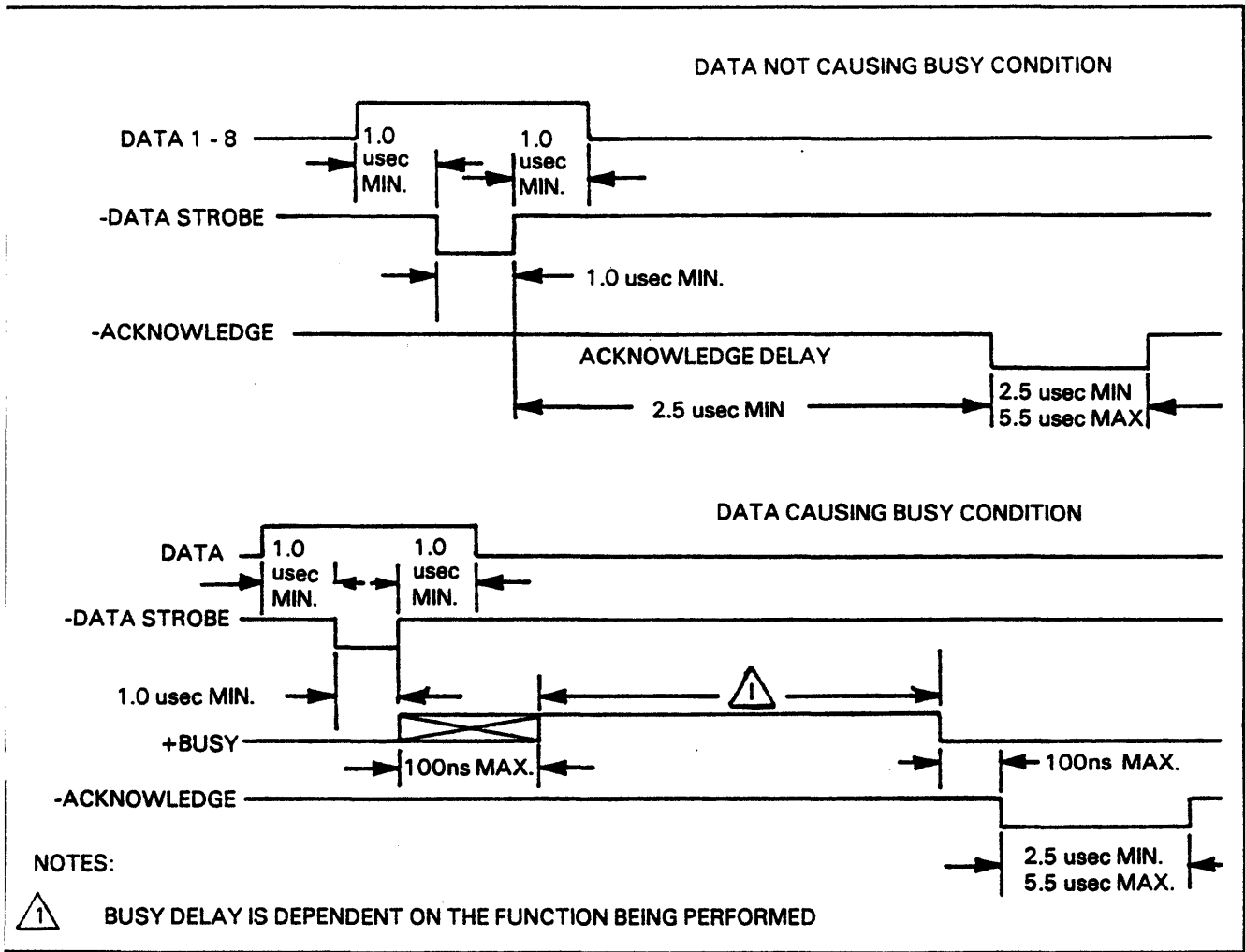


FIGURE 5-11. INTERFACE TIMING

DATA INTERCHANGE TECHNIQUE

There are different types of information that can be transmitted to the printer on the data lines. The data transmitted will be either character codes or 1 of 12 control codes. Table 5-9 shows the standard character codes and the 12 control codes.

The 12 control codes are:

BEL Code

When this code is transmitted, the printer will emit an audible tone.

CARRIAGE RETURN (CR) Code

Causes no paper advance after the contents of the print line buffer has been printed unless the Auto Line Feed switch on the CPU board is enabled.

DELETE Code

This code will reset the address of the print line buffer to zero. This allows the print line buffer to be loaded starting at the first position in the buffer. This function is switch selectable. See Switch Functions in this section for more information.

DESELECT Code

This code will remove the Select condition. When the printer has become Deselected the printer is unable to accept data, the Start or On Line indicator will extinguish. A switch selectable option is available to permit clearing the input data buffer upon deselection.

FORM FEED (FF) Code

Causes the paper to advance to the next Top of Form position after the contents of the print line buffer has been printed.

LINE FEED (LF) Code

Causes the paper to advance 1 line after the contents of the print line buffer has been printed.

There are certain times when the printer mechanism is not available for processing additional commands. When this occurs, consecutive Line Feed commands will be accepted (provided the Busy I/O signal is not active), stored and sent to the printer as a skip N Lines command when the print mechanism becomes available.

SELECT Code

This code enables the printer to accept data. When the printer is Selected, the printer's Start or On Line indicator will light.

START LOAD Code

When this code is transmitted the VFU memory load cycle is started.

STOP LOAD Code

When this code is transmitted the VFU memory load cycle is stopped.

VERTICAL TAB (VT) Code

Causes the paper to advance to the next Channel 2 position loaded between TOF position and BOF position after the contents of the print line buffer has been printed. If a Channel 2 code does not exist prior to BOF, the forms will advance to the TOF position. If a VT code is sent when the VFU buffer is not loaded, the forms will advance one inch.

ESCAPE Code

This code is sent during an IOVFU load. When this code is transmitted, the printer is expecting a sequence of characters signifying either a VFU pitch change (6 or 8 lines per inch) or a form length change. Any other use of the Escape code may cause a printer fault condition or improper printer operation.

VFU COMMAND Code

Alerts the printer that a Vertical Format Command will follow. This command is followed by a second byte of information instructing the printer to advance "n" lines or to advance to "n" channel. Upon receiving this second byte (this second command), the print line buffer is printed but no paper motion is performed until the second byte is received.

When a VFU Command code is sent, there are two types of paper motion commands that may be transmitted. The first type is an advance to channel "n" command, and the second type is an advance "n" lines command. Data bit 5 is the key bit that determines which type of command will be transmitted. If it is LO, the command will be to advance to Channel "n". If it is HI, the command will be to advance "n" lines. The maximum line count range is switch selectable at either 15 lines or up to 127 lines. Table 5-8 shows the paper motion commands and their respective codes.

TABLE 5-8. PAPER MOTION COMMANDS

DATA	BITS	PAPER MOTION COMMAND	DATA	BITS	PAPER MOTION COMMAND
8765	4321		8765	4321	
xxx0	0001	Advance to Channel 1	xxx1	0000	Advance No Lines
xxx0	0010	Advance to Channel 2	xxx1	0001	Advance 1 Line
xxx0	0011	Advance to Channel 3	xxx1	0010	Advance 2 Lines
xxx0	0100	Advance to Channel 4	xxx1	0011	Advance 3 Lines
xxx0	0101	Advance to Channel 5	xxx1	0100	Advance 4 Lines
xxx0	0110	Advance to Channel 6	xxx1	0101	Advance 5 Lines
xxx0	0111	Advance to Channel 7	xxx1	0110	Advance 6 Lines
xxx0	1000	Advance to Channel 8	xxx1	0111	Advance 7 Lines
xxx0	1001	Advance to Channel 9	xxx1	1000	Advance 8 Lines
xxx0	1010	Advance to Channel 10	xxx1	1001	Advance 9 Lines
xxx0	1011	Advance to Channel 11	xxx1	1010	Advance 10 Lines
xxx0	1100	Advance to Channel 12	xxx1	1011	Advance 11 Lines
xxx0	1101	Illegal Command	xxx1	1100	Advance 12 Lines
xxx0	1110	Illegal Command	xxx1	1101	Advance 13 Lines
xxx0	1111	Illegal Command	xxx1	1110	Advance 14 Lines
xxx0	0000	Illegal Command	xxx1	1111	Advance 15 Lines
			xx11	1111	Advance 16 Lines
					Up to
			1111	1111	127 Lines

NOTE: 0 = Logic 0 - LO
 1 = Logic 1 - HI
 x = May be Either 0 or 1

IOVFU Load

Three forms of IOVFU data are accepted by the printer:

1. A standard VFU buffer data load involving the Start Load code (1D Hex), VFU data, and a Stop Load code (1E Hex) sequence. (See Standard IOVFU Load following.)
2. A VFU vertical pitch change command sequence involving the ESC code (1B Hex), pitch value (6 or 8 LPI), and the termination code 7A Hex.
3. An I/O form change command sequence involving the ESC code (1B Hex), new form length value, and a termination code (74 Hex).

Standard IOVFU Load:

The I/O Vertical Format Unit (IOVFU) mode allows the printer to receive the format information from the data source. This mode is enabled when the printer is Selected and is not Busy. If a VFU channel command (reference Table 5-8) is transmitted to the printer when the VFU is not loaded, the printer will go Not Ready and display a fault code.

A two byte data load sequence (excluding the Start and Stop codes) is required by the VFU to represent a line on the form (two bytes per line). The first byte is called the odd data byte the second byte is called the even data byte.

The data load cycle for IOVFU information is:

1. Transmit the Start Load VFU code (1D hex).
2. Transmit Top of Form designation (Channel 1).
3. Transmit an odd data byte for Channels 3 through 6 (Channel 1 is reserved for Top of

Form, when Channel 1 and Channel 2 are set HI, the Bottom of Form position is defined).

4. Transmit an even data byte for Channels 7 through 12.
5. Repeat steps 3 and 4 as required to describe each equivalent format tape line.
6. Transmit Bottom of Form by setting bits 1 and 2 high.
7. Transmit the number of lines to be skipped over the paper perforation counting the BOF designation.
8. Transmit Top of Form designation. This is not recognized as part of the vertical format information, it is used to simulate a format tape load.
9. Transmit the Stop Load VFU code (1E hex).

The following statements qualify the load sequence:

- 1A. The relationship between the IOVFU data to be loaded and the existing paper position is determined by the order of the data load.
- 1B. The IOVFU data loaded will not be moved to the Top of Form position after the data load.
- 1C. Therefore, it is recommended that:
 - a. The paper's Top of Form position be aligned to the first line of print position before the load begins.
 - b. Channel 1 (Top of Form) be the first IOVFU data line loaded.

- 2A. The printer must be On Line and have no data in the print line buffer.
- 2B. If data is present when the Start Load command is transmitted, it will be transferred to the format tape buffer, and will be interpreted as IOVFU data.
- 3A. A pair of data bytes, one odd and one even, must be transmitted for each channel, equivalent to each format tape line.
- 3B. If an odd number of tape data bytes are transmitted, a fault will occur and:
 - a. IOVFU will not be loaded.
 - b. Any previous format tape buffer contents will be lost.
 - c. When the printer is put back On Line, it will display the code "LVFU" for Load Vertical Format Unit.
- 4A. The maximum memory size is 360 bytes, or 180 format tape lines.
- 4B. If this limit is exceeded, a fault will occur, and items 3Ba thru 3Bc will apply.
5. For the Bottom of Form to be recognized, Channel 1 (Top of Form) and Channel 2 (Bottom of Form) must be set HI.
6. If a IOVFU Load was transferred, but no Channel 1 (Top of Form) was indicated, the following conditions will exist:
 - a. If the Top of Form switch is activated, or a FF control code is transmitted, the paper will advance 1 line, and a fault code will be displayed.
 - b. If the Single Cycle switch function is attempted, the controller will have no reference point for determining the Bottom of Form position. This may result in printing past the bottom of the page.
7. If a second Top of Form (Channel 1) is not transmitted, a load error will occur.
8. The Stop Load command indicates the printer's format tape buffer has been loaded. When received, the printer responds by requesting the next transfer.

NOTE:	LOAD SEQUENCE
1. 0 = Logic 0 - LO 1 = Logic 1 - HI X = May be Either 0 or 1	1 Transmit the Start Load VFU code
	2 Transmit Top of Form code
	3 Transmit an odd tape data byte for channels 3 thru 6
	4 Transmit an even tape data byte for channels 7 thru 12
	5 Repeat 3 and 4 as needed to describe equivalent format tape line
	6 Transmit Bottom of Form code
	7 Transmit lines for perf skip (example shows 6 line skip)
	8 Transmit the Top of Form code
	9 Transmit the Stop Load VFU code
2. This example is for a 6 inch form, printed at 6 lines per inch, with a 6 line perf skip, and a total of 36 lines. (6 inch form X 6 lines per inch = 36 total lines)	(Continued)

FIGURE 5-12. STANDARD IOVFU LOAD EXAMPLE.

IOVFU Pitch Change: A vertical pitch change may be commanded from the I/O by inputting one of the following Escape code sequences.

FUNCTION	COMMAND SEQUENCE
Set 6 LPI Pitch	ESC (z(1B,5B,7A)) Hex
	OR
Set 6 LPI Pitch	ESC (1z(1B,5B,31,7A)) Hex
Set 8 LPI Pitch	ESC (2z(1B,5B,32,7A)) Hex

These command sequences will override the existing Control Panel 6/8 LPI switch pitch setting as well as change the overall physical form length. Subsequent Control Panel manual 6/8 LPI switch pitch select operations will override the I/O selected pitch value.

IOVFU Form Length Change: The format of the existing VFU data may be changed by the following I/O Escape command sequence.

ESC (nt(1B,5B,n,740)) Hex

This command will:

1. Set the new form length to n lines where n represents the decimal equivalent in ASCII code of the new line count. ie. ESC (66t will set the new form length to 66 lines and would be encoded as 1b,5b,36,36,74. This changes the current forms length to 66 lines. Current line position becomes Top of Forms, Bottom of Forms occurs 66 Lines later.
2. A channel 1 will be set on the first line of the new form.
3. Bottom of Forms is set at the last line, n, of the new form.
4. The present form position will be reset to Channel 1 (first line of the new form).

The same form length and pitch criteria as specified for a Standard IOVFU load applies.

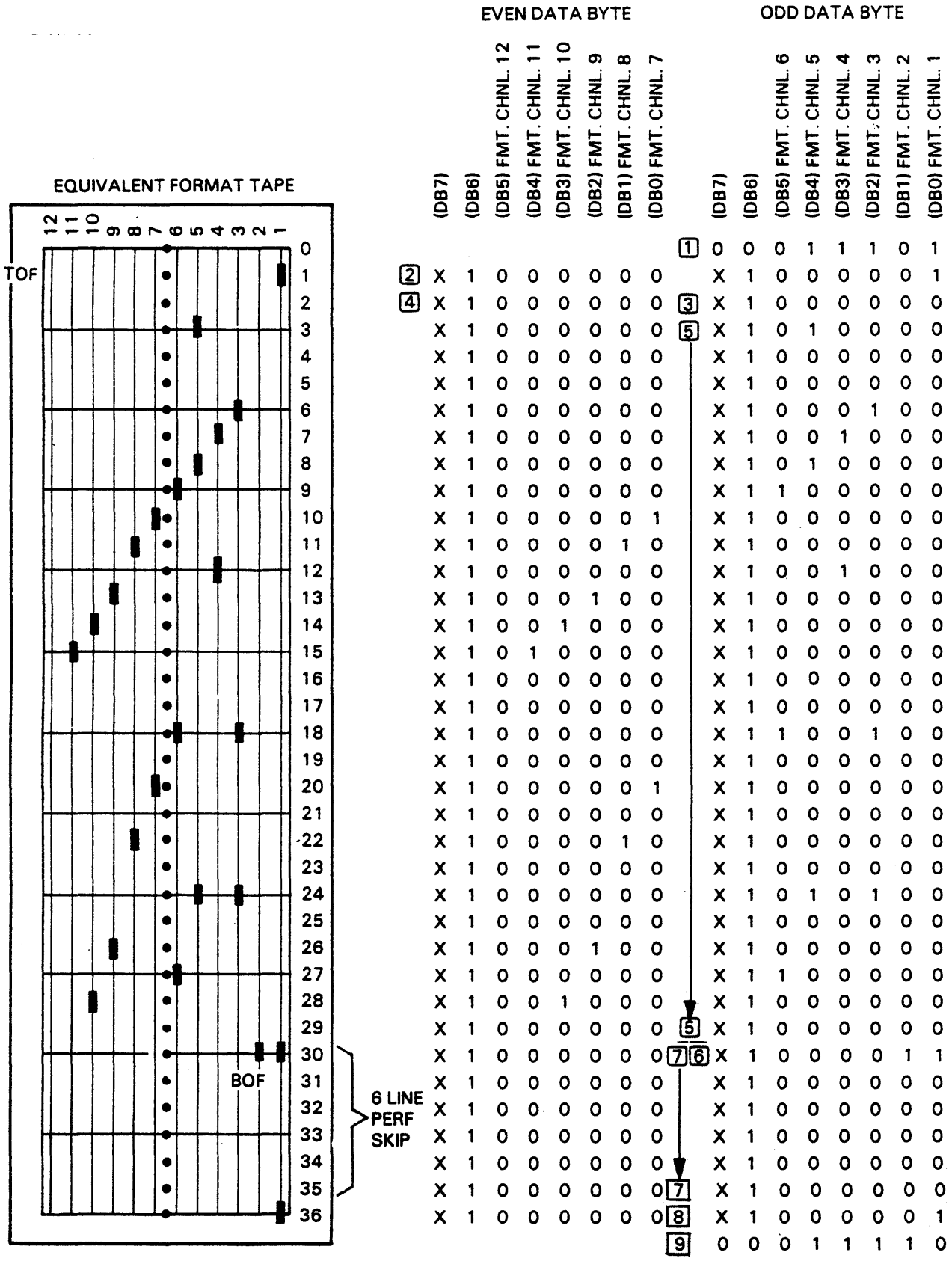


FIGURE 5-12. STANDARD IOVFU LOAD EXAMPLE (Continued).

TABLE 5-9. ASCII CHARACTER AND CODE SET

BIT POSITIONS				b7	b6	b5	0	0	0	0	1	1	1	1
b4	b3	b2	b1				0	0	1	1	0	0	1	1
							0	1	0	1	0	1	0	1
0	0	0	0						SP	0	@	P	\	p
0	0	0	1						!	1	A	Q	a	q
0	0	1	0					SELECT CODE	"	2	B	R	b	r
0	0	1	1						#	3	C	S	c	s
0	1	0	0					DESELECT CODE	\$	4	D	T	d	t
0	1	0	1						%	5	E	U	e	u
0	1	1	0						&	6	F	V	f	v
0	1	1	1					BEL CODE	'	7	G	W	g	w
1	0	0	0						(	8	H	X	h	x
1	0	0	1						)	9	I	Y	i	y
1	0	1	0					LF	*	:	J	Z	j	z
1	0	1	1					VT	+	;	K	|	k	{
1	1	0	0					FF	,	<	L	\	l	!
1	1	0	1					CR	-	=	M	]	m	}
1	1	1	0						.	>	N	^	n	~
1	1	1	1						/	?	O	-	o	DELETE CODE

③
64
96
④
⑤

NOTES:

- ① THE ABOVE CODE SET IS VALID WHEN THE TEST PRINT MODE SELECT SWITCH ON THE CPU BOARD IS IN THE OFF POSITION.
- ② THE ABOVE CODE SET IS USED WHEN THE BAND CODE TRANSLATOR ROM'S ARE DISABLED (IN OFF POSITION).
- ③ ALL UNDEFINED CODES IN THE FIRST TWO CHART COLUMNS WILL BE ACKNOWLEDGED AND ACCEPTED WITH NO PRINTER ACTION TAKING PLACE WHEN ASCII CONTROL CODES ARE USED.
- ④ ALL CODES IN LAST TWO COLUMNS WILL BE TREATED AS SPACE CODES WHEN A 64 CHARACTER BAND IS INSTALLED.
- ⑤ THIS CODE IS A SWITCH SELECTABLE OPTION ON THE PERSONALITY MODULE AND IS CONSIDERED A CONTROL CODE.

INTERFACE CONNECTORS

Standard Interface Connector

The connector provided with the printer is a chassis mounted 36 pin female Amp type 1284-84-17-1 (or

equivalent) connector. The connector is shown in Figure 5-13. Table 5-10 shows the interface signals and their associated connector pin assignments. No data cable or mating connector is provided with the printer.

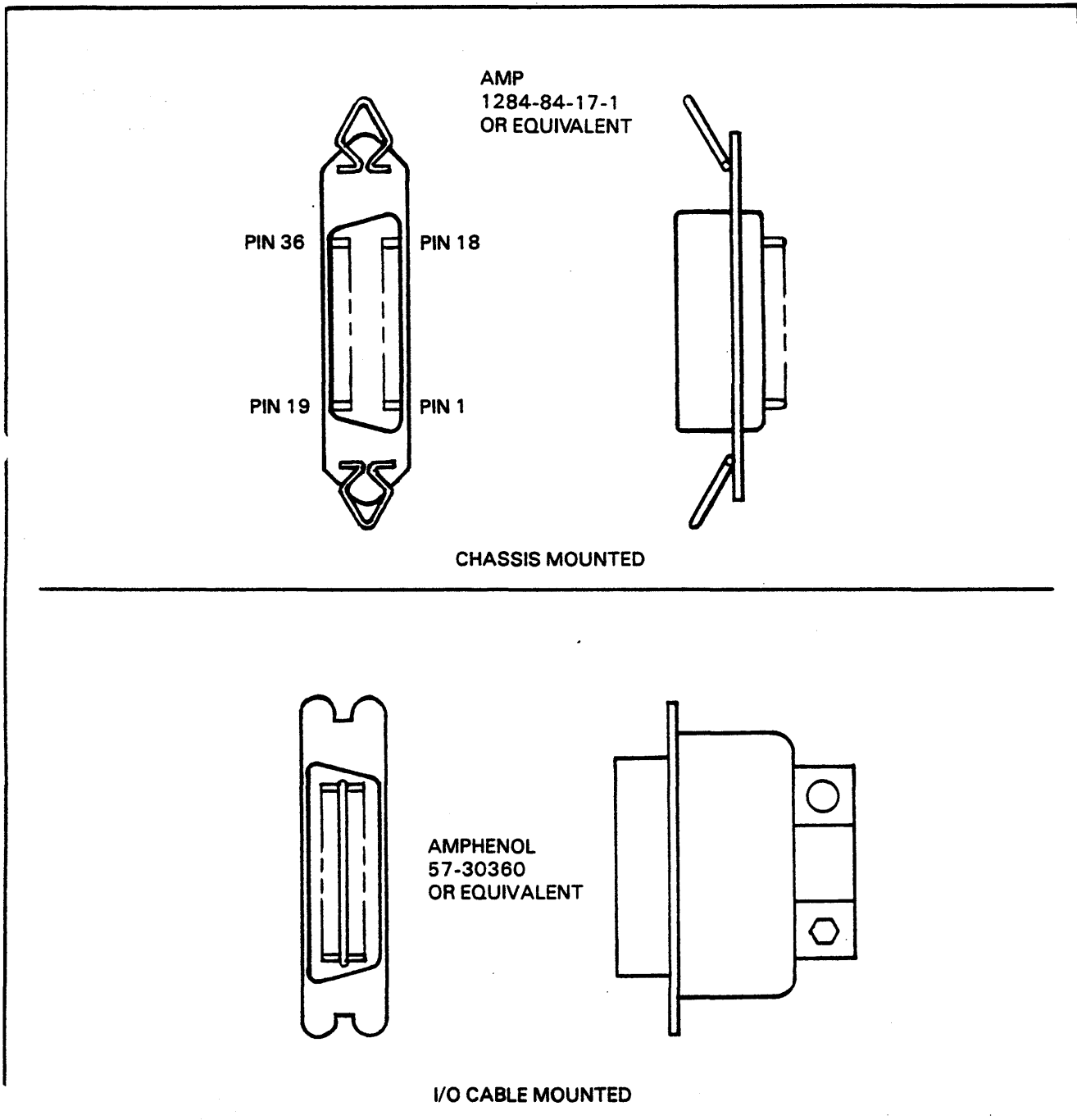


FIGURE 5-13. INTERFACE CONNECTOR CONFIGURATION

TABLE 5-10. I/O CONNECTOR PIN ASSIGNMENTS

<u>PIN NO.</u>	<u>SIGNAL</u>	<u>PIN NO.</u>	<u>SIGNAL</u>
10	-ACKNOWLEDGE	28	-ACKNOWLEDGE RETURN
11	+BUSY	29	+BUSY RETURN
17	CHASSIS GROUND	35	OPEN
2	+DATA BIT 1	36	OPEN
3	+DATA BIT 2	20	+DATA BIT 1 RETURN
4	+DATA BIT 3	21	+DATA BIT 2 RETURN
5	+DATA BIT 4	22	+DATA BIT 3 RETURN
6	+DATA BIT 5	23	+DATA BIT 4 RETURN
7	+DATA BIT 6	24	+DATA BIT 5 RETURN
8	+DATA BIT 7	25	+DATA BIT 6 RETURN
9	+DATA BIT 8	26	+DATA BIT 7 RETURN
1	-DATA STROBE	27	+DATA BIT 8 RETURN
14	LOGIC GROUND (Printer)	19	-DATA STROBE RETURN
16	LOGIC GROUND (Printer)	32	-FAULT
12	+PAPER EMPTY	31	-INPUT PRIME
13	+SELECT	30	-INPUT PRIME RETURN
15	125 KHz CLK	33	Reserved
18	+5V (Printer)	34	Reserved

RS-232 SERIAL INTERFACE PERSONALITY MODULE

The RS-232 personality module is designed to interact between the Linewriter printer and a data communications interface. The message protocols can be transmitted in an asynchronous mode or a synchronous mode and is controlled by two printed circuit boards: The I/O adaptor board 6PC1 which contains the receivers and transmitters, and the personality module which contains the logic and firmware and handles the protocol and interfacing to the printer system.

ASYNCHRONOUS TRANSMISSION (Figure 5-14)

In asynchronous data transmission each block of data bits representing a character is framed by synchronizing bits. The first synchronization bit sent is a start bit. This is followed by the data bits (7 or 8 selectable, least significant bit first), checked for odd, even or no parity (if enabled), followed by one or two stop bits (selectable). This data synchronization is done on a character by character basis.

The start and stop bits start the cyclical operation of the printer and stop it for each character sent. During each cycle, the printer has a timing reference (the start bit) from which it can determine the subsequent time segment during which each

data bit is supposed to occur. The printer samples the incoming signal close to the center of these time segments and determines whether a "0" or a "1" is present. The printer then composes the data bit into a character. At the same time, the printer will check the parity of the character if enabled and notify the host if the character received has a parity error. If the parity is correct, the character is transferred to the interface buffer memory (2K bytes is standard, but can be expanded to 4K bytes).

The data is ASCII encoded and decoded and can be transmitted at any of the following baud rates (bits per second): 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, and 19200.

Asynchronous transmission does not require a clock to be transmitted with the data. Each character contains the means by which synchronization between the host and the printer is maintained. This permits sending characters at irregular rates. Redundancy is necessary however, for synchronization. In an 11 bit code for example, 27.2% of the transmission time is required for synchronization and as the transmission speed increases, the amount of time occupied by the start and stop bits become proportionately greater.

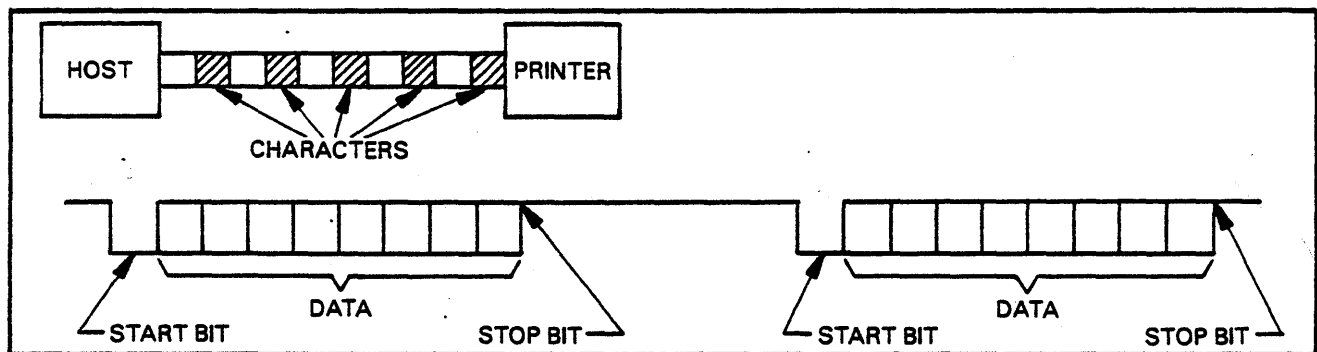


FIGURE 5-14. START - STOP ASYNCHRONOUS DATA TRANSMISSION

SYNCHRONOUS TRANSMISSION (Figure 5-15)

Synchronous data transmission requires that:

- a. A clock signal be transmitted with the data to mark the location of the data bits for the printer.
- b. Synchronization patterns be added to the start of the transmission so that the printer can locate the first bit of the message.
- c. Each data bit must follow contiguously (be adjoined) after the synchronous word since one data bit is assumed for every clock period.

Note that the transmission of the synchronous word uses a much smaller portion of the transmission time than do the start-stop elements of asynchronous transmission.

The printer interface can be optioned to time its receive data sampling rate synchronously with the "Receiver Signal Element Timing" line from the host. Transmission data will be synchronous with the "Transmitter Signal Element Timing" line. Bit data will change on the rising (OFF to ON) edge of the Transmitter Signal Element Timing (TSET) and sampled on the falling (ON to OFF) edge of the Receiver Signal Element Timing (RSET) lines.

The printer will transmit (or hunt) for one or two Sync Characters (programmable) and then send (receive) a 7 or 8 data bit character (programmable), and a parity bit (if enabled). The start or stop bits are not used in the synchronous mode. When a parity or overrun error is detected, the printer will start a new hunt sequence. This means that data following the error may also be lost.

The printer may also be programmed to send and receive synchronous data at bit rates of 300, 600, 1200, 1800, 2400, 4800, 9600, and 19200 using an internally generated clock. This clock may be optionally sent out on the Transmitter Signal Element Timing Line to allow the Host to synchronize with the printer.

NOTE

WHEN IN THE SYNCHRONOUS MODE, THE HOST SHOULD MAINTAIN SYNC CHARACTER TRANSMISSION EVEN WHEN NOT SENDING DATA, OTHERWISE THE PRINTER WILL WAIT UNTIL THE NO ACTIVITY TIMER TIMES OUT TO HUNT AGAIN FOR SYNC.

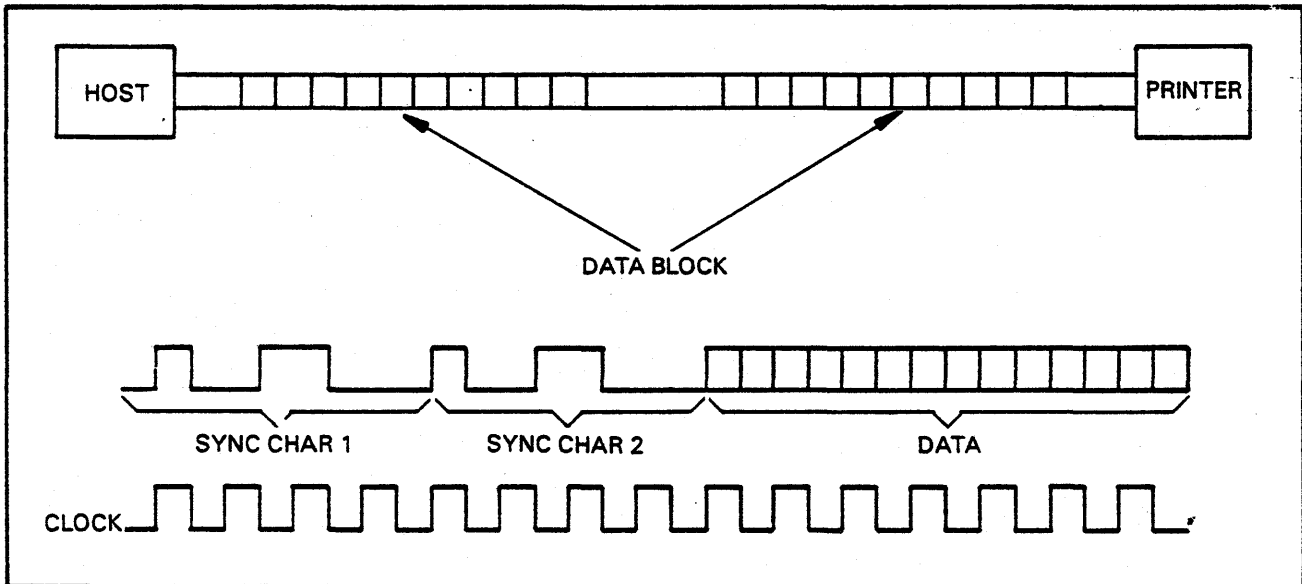


FIGURE 5-15. SYNCHRONOUS TIMING RELATIONSHIP

INTERFACE SIGNALS (Figure 5-16)

This section describes the interface signals associated with this interface. The signal names and I/O pin assignments are listed in Table 5-15. Note that RS-449 systems may require special connector adaptors when used in RS-232 installations.

Clear to Send (CTS) (To Printer)

After the host has received the Request to Send from the printer and is capable of accepting a transfer from the printer, it will set the Clear to Send line to space (0) ON and hold it on as long as it is capable of accepting data. The printer may also be programmed to internally set CTS to a constant ON condition.

Data Set Ready (DSR) (To Printer)

Signals in this circuit are used to indicate the status of the local host data set. The mark (1) OFF condition is an indication that the printer is to disregard signals appearing on the Receive Data Line. The space (0) ON condition indicates that the data set is in a ready condition. This signal can be programmed to a constant ON condition at the printer. Any pending status transmission from the printer will be cancelled if this line is OFF.

Data Terminal Ready (DTR) (From Printer)

A signal on this line is generated by the printer's communication interface to indicate that it is capable of receiving data. This signal is on when:

- a. Power is on.
- b. The printer has paper installed.
- c. The printer is ready to print.
- d. The interface buffer has not overflowed. (If the Halt On Transmission Error option is active).

When in the Auto Answer mode and connected to a modem on the telephone lines, if this line changes state from ON to OFF, it will cause the printer to ignore any further data sent. However, the printer will respond to status requests if possible, when Data Terminal Ready is OFF if a fault condition exists. The printer may be optioned to keep Data Terminal Ready on at all times when the printer is powered up. Note that it is possible to lose data when Data Terminal Ready is OFF.

Local Loopback (From Printer)

This signal will be activated when the operator selects the local loopback test mode and presses the START switch on the Control Panel. The printer will then monitor the test mode signal (Data Communication Equipment) and when active, it will send a sliding alpha ASCII print pattern followed by a Line Feed (LF) command. The printer will then monitor the Received Data Lines for an exact echo of the transmitted data from the local modem. The operator may select this received data to print if required.

Protective Ground (Between Printer and Host)

This conductor is electrically connected to the equipment frame.

NOTE:

SIGNAL GROUND AND PROTECTIVE GROUND CAN BE TIED TOGETHER IN THE PRINTER OR CAN BE SEPARATED BY REMOVAL OF A 100 OHM RESISTOR.

Receive Common (In RS-449 Mode Only)

This line provides the signal return reference for Incoming Call (IC) and Test Mode (TM) signals coming to the printer from the host. It is connected to each differential receiver's reference pin and is not connected to the printer's common signal ground.

Received Data (To Printer)

Serial data (synchronous or asynchronous), signals on this line are generated by the host. This line is to be held in the OFF (marking) condition at all times when the Received Line Signal Detector (RLSD) line is in the OFF (1) condition.

Received Line Signal (Carrier) Detector (RLSD) (To Printer-Optional)

The ON condition of this optional line indicates that the data communication equipment is receiving a signal which meets its suitability criteria. These criteria are established by the data communication equipment manufacturer.

The OFF condition indicates that no signal is being received or that the received signal is unsuitable for demodulation. The OFF condition of this line will cause the received data line to be ignored if the Monitor Received Line Signal Detector option is enabled.

When in the Auto Answer mode and this line changes from ON to OFF (for a time determined by the Set No Activity Timer option) the printer will return to the Data Terminal Ready OFF condition after the printer has completed any pending data transmissions. For this to occur, the Set No Activity Timer must not be set to zero (seconds). This signal must remain ON for a minimum of 200 us after the last character has been transmitted to the printer.

This signal can be programmed to a constant ON condition at the printer.

Receiver Signal Element Timing (To Printer-Optional)

This signal may be optionally selected to be used by the printer to time its received data when in the synchronous mode. Data will be sampled on the ON to OFF transitions.

Remote Loopback (From Printer)

This signal will be activated when the operator selects the remote loopback test mode and presses the START switch on the Control Panel. This operation is similar to the local loopback operation except that the host's remote modem will return the loopback data to the printer.

Request to Send (RTS) (From Printer)

This line is used to indicate that the printer has data to be transmitted to the host. When the printer is ready to transfer data or control information to the host, the Request To Send line will be at space (0) ON and it will be held on as long as there is information to be transferred. In the receive only mode, this line will be held in the marking (1) OFF condition. It can also be programmed to be constantly ON. When RTS is to be switched, it will be turned ON only when both Clear To Send and Received Line Signal Detector are both OFF (if Clear To Send & Received Line Signal Detector are selected to be monitored).

Reverse Channel (From Printer-Optional)

This signal is ON when the printer interface has not detected the following:

When the interface buffer is nearly full (as set by the selectable threshold points) or Data Terminal Ready is OFF. The reverse channel will be OFF for at least 200 MSEC or until the contents of the buffer have been reduced to below nearly empty (as set by the selectable threshold points). Printer speed may be degraded if data is being removed from the interface buffer at a rate which requires that more data be input (Almost Empty threshold) before the 200 ms time has elapsed. This condition can be avoided by setting the threshold points so that there will be sufficient data in the buffer to keep the printer in operation for at least 200 ms.

NOTES:

THIS SIGNAL MAY BE SWITCH SELECTED TO DRIVE EITHER RS-232C PIN 19 (SCA-SECONDARY REQUEST TO SEND) OR PIN 11 (UNASSIGNED).

IN RS-449 MODES THE SRS (SECONDARY REQUEST TO SEND) LINE WILL BE DRIVEN WHEN THE REVERSE CHANNEL OPTION IS SELECTED AND THE OPTIONAL 9 PIN CONNECTOR IS INSTALLED.

THE ACTIVE POLARITY OF THIS SIGNAL MAY BE SELECTED AS AN OPTION SETUP.

Ring Indicator (To Printer-Optional)

The ON condition indicates that a ringing signal is being received on the communication channel. This signal is used with the optional Auto Answering mode. The printer will respond by activating the Data Terminal Ready line if it is able to accept data.

Send Common (From Printer) (in RS-449 (i.e. RS-422, 423) Modes Only)

This line provides the signal return reference for the Remote Loopback (RL), the Local Loopback (LL) and the Secondary Request to Send (SRS) signals sent to the host from the printer. It is not to be connected to the host's common signal ground.

Signal Ground (Between Printer and Host)

This signal provides the signal reference point for both received and transmitted signals. It is a signal return line only when in the RS-232C mode (See Send and Receive Common signal definitions following). It is not the system's protective or frame ground.

Test Mode (To Printer)

This signal is used to respond to either the LL or RL signals from the printer. It indicates that the host system will return any data from the printer back to the printer. The printer will then begin the test. In RS-232 Mode, this line may be jumpered to be held active internally.

Transmitted Data (From Printer)

This serial data (synchronous or asynchronous) line is sent from the printer to the host to send printer status and response data. This line will typically be held in the OFF (marking) condition when Request to Send or Clear to Send are in the OFF condition.

Transmitter Signal Element Timing (From Printer-Optional)

This printer supplied signal may be optionally selected to be used by the host to transmit data to the printer when in the synchronous mode. The frequency of this signal is determined by the printer baud rate select circuitry at times one (x 1). Data will be changed on the OFF to ON transitions of this signal.

Transmitter Signal Element Timing (To Printer-Optional)

This signal may be optionally selected to be used by the printer to time its transmitted data, when in the synchronous mode. Data will change on the OFF to ON transition of this signal.

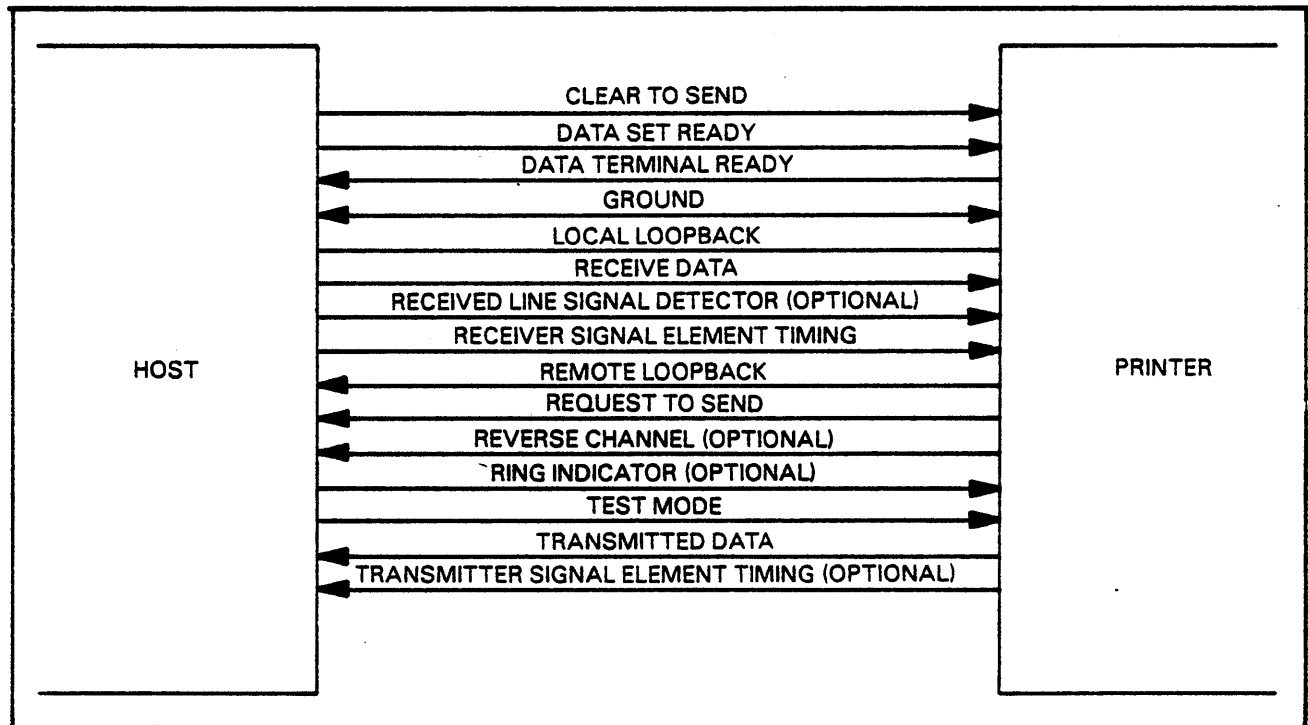


FIGURE 5-16. DATA SOURCE TO PRINTER INTERFACE LINES

CONTROL CODES (Table 5-11)

The printer will recognize 11 ASCII control codes. All other codes between 00 (hex) and 1F (hex) will cause an invalid control code response and all data following the invalid control code will be treated as print or control data. The 11 valid ASCII control codes are:

CODE	FUNCTION	7 or 8 BIT ASCII
BEL	Bell	07 (hex)
CR	Carriage Return	0D (hex)
DEL	Delete	7F (hex)
ESC	Escape	1B (hex)
FF	Form Feed	0C (hex)
HT	Horizontal Tabulation	09 (hex)
LF	Line Feed	0A (hex)
NUL	Null	00 (hex)
SI	Shift In	0F (hex)
SO	Shift Out	0E (hex)
VT	Vertical Tabulation	0B (hex)
SELECTED SYNC CODE		

Bell

The Bell character will be used to sound the audible alarm in the printer for 1 second.

Carriage Return

The Carriage Return character will cause the print position to move to the first active position (Column 1) on the current line. If the Auto New Line on Carriage Return option is set, a Line Feed function will also be performed.

Delete

The Delete character will be treated the same as the Null character.

Escape

The Escape character will be used as the first character of a control sequence.

Form Feed

The Form Feed character will cause the print position to be moved to the first active position (column 1) on the first active line on the next page as indicated by an EVFU channel 1 stop.

Horizontal Tabulation

The Horizontal Tabulation character will cause the print position to be moved to the column on the current line specified by the first preset horizontal tabulation stop to the right of the current position. If no tabulation stops are set to the right of the current position, the Horizontal Tabulation character will default to a space character. If the current position is at the right margin, a Carriage Return/Line Feed function will be performed if the Automatic New Line on Right Margin option is active. Otherwise, this control code will be ignored. The active position will always move, even if a tabulation stop is set at the current active position.

Line Feed

The Line Feed character will cause the form to be moved vertically one line space, as determined by the preset vertical pitch. If the Perf Skip Select switch on the CPU board is set and if a Line Feed function is performed which would cause the print line to fall in the perf skip area, the paper will be positioned to the top of the next form. The CPU switch settings determines the length of the perf area (in lines) as follows:

Forms Length Switch Mode:
3, 4, 5 or 6 lines.

EVFU Mode:
Channel 1 = Top of Forms
Channel 2, 8 or 12 = Bottom of Forms

The printer will convert all consecutive Line Feed control codes (or Carriage Return codes if the Auto New Line on Carriage Return option is selected) into multiple line skip operations under the following conditions:

- When the line counter mode is active (either by setting the CPU switch or by an EVFU load).
- When the Slew to Top of Forms mode is selected (by setting the CPU switch).

Null

The Null character will be used for time fill, or anytime it is necessary for the host to transmit a character that will have no effect on the printer. It will always be ignored by the printer if the Ignore NUL/DEL Codes Without Echo or S.O. Conversion option is set. If this option is not set, the NUL/DEL codes may be changed by the S.O. mode or echoed when in the echo mode.

Selected Sync Code

The selected sync code will be treated as a null code when in synchronous data mode.

Shift In

When the SI/SO (Shift In/Shift Out) option is enabled, and SI is transmitted by the data source, it indicates that the characters that follow are interpreted according to the ASCII code set. The SI code control character is to be used only after a SO character has been transmitted. A second SI code will be ignored. The SI character will cause all following character's bit 8 to be reset to a logical (0) after a SO code had caused it to go to a logical (1). If SI/SO option is not enabled, the SI character will be ignored.

Shift Out

The printer SI/SO option has four selections which are displayed as "N" (Not Enabled), "LA" and "LB" (Limited Enable), and "F" (Full Enable). The Full Enable reacts to all received codes and the Limited Enable reacts only to codes 21 thru 7E (hex) for "LA", or codes 20 thru 5F (hex) for "LB".

When the SI/SO option is enabled and SO is transmitted by the data source, SO indicates that the characters that follow are interpreted as outside the ASCII code set until a SI (Shift In) control character is detected. The SO code causes an 8th bit (logic 1) to be added to each data character received by the interface until an SI code is sent (except Null and Delete if the Ignore NUL/DEL Codes Without Echo or S.O. Conversion option is set. SYNC codes will also be ignored when in the synchronous data mode). The interface then translates the code into the proper internal character codes before sending it on to the print line buffer. If 8 bit data is optioned, the SI/SO mode may be disabled. If SI/SO is not optioned, the SO character will be ignored (same as a null).

NOTE:

A 128 OR 192 CHARACTER ROM AND CORRESPONDING PRINT BAND MUST BE INSTALLED IN THE PRINTER IN ORDER TO MAKE USE OF THIS FEATURE.

Vertical Tabulation

The Vertical Tabulation character will cause the form to advance to the line specified by the first preset vertical tabulation stop encountered after the current line. If no tabulation stops are set, a "channel selected not loaded" (CHAN or CHSL) status on the Control Panel will appear and a line feed function will be performed. If the VT character has been disabled by means of an option bit, a Line Feed function will be performed. If when the VT character is received, the form is positioned below the last vertical tabulation stop on the page, the paper will advance to the first stop on the next page. The paper will always move, even if a vertical tabulation stop is set at the current line. This function will also invoke stops set in EVFU channel 3 or 4, depending on which channel is selected by the option switch on the CPU board.

This is correct

TABLE 5-11. ASCII CHARACTER AND CODE SET

BIT POSITIONS				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1									
0	0	0	0	NUL	/	SP	0	@	P	\	p	
0	0	0	1	/	|	1	A	Q	a	q		
0	0	1	0	/	"	2	B	R	b	r		
0	0	1	1	/	#	3	C	S	c	s		
0	1	0	0	/	\$	4	D	T	d	t		
0	1	0	1	/	%	5	E	U	e	u		
0	1	1	0	/	&	6	F	V	f	v		
0	1	1	1	BEL	'	7	G	W	g	w		
1	0	0	0	/	(	8	H	X	h	x		
1	0	0	1	HT	)	9	I	Y	i	y		
1	0	1	0	LF	*	:	J	Z	j	z		
1	0	1	1	VT	ESC	+	;	K	|	k	{	
1	1	0	0	/	,	<	L	\	l	!		
1	1	0	1	CR	-	=	M	]	m	}		
1	1	1	0	SO	.	>	N	^	n	~		
1	1	1	1	SI	/	?	O	-	o	DEL		

1 = OFF
0 = ON
SWITCH 1 = LEAST SIGNIFICANT BIT

③

64

96

④

NOTES:

- 1 THE ABOVE CODE SET IS VALID WHEN THE TEST PRINT MODE SELECT SWITCH ON THE CPU BOARD IS IN THE OFF POSITION.
- 2 THE ABOVE CODE SET IS USED WHEN THE BAND CODE TRANSLATOR ROM'S ARE DISABLED (IN OFF POSITION).
- ③ ALL UNDEFINED CODES IN THE FIRST TWO CHART COLUMNS WILL BE ACKNOWLEDGED AND ACCEPTED WITH NO PRINTER ACTION TAKING PLACE WHEN ASCII CONTROL CODES ARE USED.
- ④ ALL CODES IN LAST TWO COLUMNS WILL BE TREATED AS SPACE CODES WHEN A 64 CHARACTER BAND IS INSTALLED.
- 5 ALL DATA PARAMETER STRINGS SENT TO OR FROM THE PRINTER WILL BE SENT WITH THE MOST SIGNIFICANT ASCII CHARACTER DIGIT FIRST (LEFT TO RIGHT AS READ).
- 6 THE PRINTER'S SPEED MAY BE AFFECTED WHEN NON-PRINTABLE COMMANDS ARE INSERTED INTO THE DATA STREAM (eg. Status Request, Load IOVFU, etc.)
- 7 IF THE IGNORE NUL/DEL CODES WITHOUT ECHO OR S.O. CONVERSION OPTION IS NOT SET, ANY NUL OR DEL CODES WHICH APPEAR WITHIN AN ESCAPE SEQUENCE WILL CAUSE AN INVALID CONTROL SEQUENCE ERROR.

LOAD EVFU DATA

This function will provide the capability of maintaining the EVFU information via the interface when the printer is configured for the IOVFU option by a switch on the CPU board. The twelve available channels will be represented in one or two ASCII characters (1-12). The lines will be expressed in one to three ASCII characters (1-176) with line 1 to be the first line on the page. The encoding of the function will be:

1B5023(PS)1B5C (Hex) (seven bit characters)

or 9023(PS)9C (Hex) (eight bit characters)

Where (PS) is the parameter string, each parameter will consist of one or more ASCII characters. They will be separated by ASCII semicolon, ";". Depending on the function to be performed, parameter strings will be in one of the following forms (these parameters may be sent in any order):

NOTE

THE LAST CHARACTER IN THE
PARAMETER STRING SHOULD NOT
BE FOLLOWED BY A SEMICOLON ";"

- a. To clear the EVFU memory storage area, the parameter ASCII "R" can be inserted anywhere in the parameter string. All EVFU data received prior to the "R" will be cleared.
- b. To set any format channel hole on individual lines, the parameter string will consist of ASCII "L" followed by the line number followed by a sequence of the channels to be assigned on this line. An example for the parameter string will be as follows: L1;1;2; (Line 1 channels 1 and 2) L10;3;11;7; (Line 10 channels 3, 11, and 7) L22;2; (Line 22, channel 2) etc.
- c. To clear certain channel holes on individual lines, the parameter string will consist of ASCII "C" followed by the line number followed by a sequence of the channels to be cleared on this line. An example for the parameter string will be as follows: C2;2; (Clear line 2, channel 2) C11;3;4; (Clear line 11, channels 3 and 4) C25;6 (Clear line 25, channel 6) etc.
- d. The total number of lines on the form is indicated by an ASCII "T" followed by the number of lines (up to 3 ASCII digits). (The minimum form length allowed is 3

inches and the maximum is 22.5 inches at 8 lines per inch or 30 inches at 6 lines per inch). Note: The total lines on the form must be loaded at least once after power-on for the EVFU load to be valid.

SELECT VERTICAL PITCH

This function will allow selection of either 6 or 8 lines per inch vertical pitch. It will be encoded as:

1B5B(P)2047 (Hex) (seven bit characters)

or 9B(P)2047 (Hex) (eight bit characters)

The parameter (P) will have the value 313230 (Hex) for 6 lines per inch, or 3930 (Hex) for 8 lines per inch.

RESET TO INITIAL STATE

This function will cause the following:

- a. All tabulation stops (horizontal and vertical) will be cleared.
- b. The SI mode will be set.
- c. Vertical pitch will be set to the value specified by the Control Panel Form Length switches.
- d. The page length will be set to the Form Length switch value, the Line Counter (relative vertical position) mode will be activated if the Select Line Counter mode switch on the CPU board is set, and the EVFU will be in the "not loaded" state.

The encoding of this function will be "ESC c" (1B63) in either 7 or 8 bit mode. Pending fault status will not be cleared.

SKIP TO VERTICAL CHANNEL

This function will cause the paper to advance to the position specified by the next preset stop in the EVFU channel specified by the numeric parameter. It is encoded as:

1B5022(P)1B5C (Hex) (seven bit characters)

or 9022(P)9C (Hex) (eight bit characters)

Where (P) represents a parameter of one or two ASCII characters (legal values are 1 - 12). If no stop is set in the channel selected, a line feed function will be performed and the "CHAN" code error will be displayed and an I/O status code of 28 will be active to indicate that the channel selected is not included in the EVFU loaded information.

REPEAT CHARACTER

This function will cause the preceding character, if it is printable, to be repeated in a string beginning at the current print position. The parameter will define the length of the string. The function is encoded as:

1B5B(P)62 (Hex) (seven bit characters)

or 9B(P)62 (Hex) (eight bit characters)

Where (P) represents the numeric parameter of one to three ASCII characters. If the preceding character was a control code or a control sequence, the repeat character function will be ignored.

RELATIVE HORIZONTAL POSITIONING

This function may be used for space compression. It will cause the print position to advance the number of character positions specified by the numeric parameter. The encoding of the function will be:

1B5B(P)61 (Hex) (seven bit characters)

or 9B(P)61 (Hex) (eight bit characters)

Where (P) represents the parameter of one to three ASCII characters. The effect will be the same as if that number of space characters has appeared in the data stream.

RELATIVE VERTICAL POSITIONING

This function may be used to specify a multiple line advance. It will be encoded as:

1B5B(P)65 (Hex) (seven bit characters)

or 9B(P)65 (Hex) (eight bit characters)

Where (P) will represent the numeric parameter of one to three ASCII characters, specifying the number of lines to be advanced (127 lines maximum).

NOTE

THE PRINTER WILL ADVANCE BY A LINE-AT-A-TIME RATE UNLESS THE LINE COUNTER MODE IS ACTIVE (EITHER BY CPU SWITCH SETTING OR BY PERFORMING AN EVFU LOAD).

SET HORIZONTAL TABULATION

This function will provide the capability of setting horizontal tabulation stop locations on the line. The encoding of the function is as follows:

1B5B(PS)204E (Hex) (seven bit characters)

or 9B(PS)204E (Hex) (eight bit characters)

Where (PS) is the parameter string, each parameter will be represented in one to three ASCII characters to define the column number for a tab set on the line. The parameters will be separated by the ASCII semicolon ";". The last parameter should not be followed by a semicolon ";;".

Upon entering this Horizontal Tab set mode or if an error is detected during the load, all previous load data will be cleared and the printer will be in the unloaded HT condition.

NOTE

THE RIGHT MARGIN SETTING WILL ALWAYS BE DETERMINED BY THE CONTROL PANEL SETTING OR DEFAULT HORIZONTAL TAB SETTING.

STATUS REQUEST/RESPONSE

A complete status report containing the information about the status of the printer controller and the I/O adapter is available to the Data Communication Equipment from the printer upon request. The request will be encoded as:

1B5B70 (Hex) (seven bit characters)

or 9B70 (Hex) (eight bit characters)

The printer response will be encoded as:

1B5024(PS)1B5C (Hex) (seven bit characters)

or 9024(PS)9C (Hex) (eight bit characters)

Where (PS) is the parameter string, each parameter will consist of one to four ASCII characters and may begin with an ASCII letter. Parameters will be separated by ASCII semicolons ";". Table 5-12 lists the status values, and their assigned numbers. Status numbers will be returned when that status is active.

The printer will respond to status requests in the data stream sequence unless the Immediate Status Response option is set, a fault is detected or a buffer overflow condition exists. In this case, the printer will respond to new status requests immediately as well as in data stream sequence. This allows for fault and data recovery when possible. However, data sent after buffer full may be lost.

All detected data and control code errors (e.g. transmission, invalid, etc.) will be reported until cleared by one of the following:

- a. Pressing I/O FAULT RESET on the Control Panel.
- b. A completed status response sequence.
- c. A diagnostic test (Test 4 following) is performed.
- d. Upon power on.

Printer status will remain active until cleared by the Control Panel RESET switch.

TABLE 5-12. STATUS DEFINITION

STATUS CODE	PRINTER STATUS	STATUS CODE	PRINTER STATUS
0	Controller Hardware Error	55	Vertical Format Error
1	Odd Half Space	56	Compressed Pitch
2	Inhibit is on	57	Standard Pitch
3	Horizontal Error (LW400 Only)	58	48 Band
4	Fuse 2 (Clamp)	59	64 Band
5	Hammer Fault 1	60	96 Band
6	Power Fault 1	61	128 Band
7	Blower Fault	62	48 Statistical Band
8	Stepper Fault	63	64 Statistical Band
9	NHOM Fault (LW400 Only)	64	96 Statistical Band
10	Out Of Paper	65	192 Statistical Band
11	Forms Error (Off Line Only)		INTERFACE STATUS
12	Ribbon Error	66	2K Input Buffer
13	Gate Open	67	4K Input Buffer
14	Band Motor Speed Error	68	SO/SI Enabled
15	Band Sync Error	69	New Line on CR
16	Band Error	70	Line Feed On Right Margin Enabled
17	Paper Runaway	71	Convert VT To LF Enabled
18	Forms Less Than 3 Inches	72	Lower Case Translation Enabled
19	Forms Tape Verify Error	73	Sound Bell On Invalid Control Code
20	Reserved	74	Halt On Invalid Control Code
21	Line Counter Sel Error	75	Substitute On Invalid Control Code
22	Tape Reader Error	76	Sound Bell On Invalid Control Seq.
23	Data Overflow	77	Halt On Invalid Control Sequence
24	Format Tape Error	78	Substitute On Invalid Control Seq.
25	No Top Of Forms	79	Sound Bell On Transmission Error
26	Data Format Error	80	Halt On Transmission Error
27	EVFU Load Overflow	81	Substitute On Transmission Error
28	Channel Selected, Chan Not Loaded	82	Even Parity Enabled
29	Channel Selected, EVFU Not Loaded	83	Odd Parity Enabled
30	Illegal Channel	84	Auto Answer Enabled
31	Illegal Code	85	Monitor Data Set Ready
32	Page Error	86	Monitor Recvd Line Signal Detector
33	Illegal Initialization of Proc.	87	RTS With Wait For CTS Mode
34	Diagnostic ROM Installed	88	RTS W/O Wait For CTS Mode
35	Fuse 3 (Stepper)	89	RTS Const With Wait For CTS Mode
36	Fuse 4 (36V) LW400	90	RTS Const W/O Wait For CTS Mode
37	Fuse 5 (36V) LW800	91	RTS Off With Wait For CTS Mode
38	Illegal EVFU Load Attempt	92	RTS Off Without Wait For CTS Mode
39	Forms Length Control Mode	93	Drop Data Term. Ready Enabled
40	IOVFU Mode	94	XON/XOFF Enabled
41	TLVFU Mode	95	REVCH:Almost Full = On = Inverted Mode
42	8253 Error	96	REVCH:Almost Full = Off = Normal Mode
43	I/O Select 6/8 Lines Per Inch	97	Break Enabled
44	6 Lines Per Inch	98	Input Transmission Error
45	8 Lines Per Inch	99	Invalid Control Code
46	EVFU Loaded	100	Invalid Control Sequence
47	Auto Line Feed Enabled	101	Buffer Overflow
48	Auto Perf Skip Enabled	102	Right Margin Overflow
49	Vertical Tab Select Chan 3	103	Invalid HT Load
50	Vertical Tab Select Chan 4	104	Invalid EVFU Load
51	Slew to Top Of Form	105	Data Terminal Ready
52	Bottom of Form Chan 2	106	Hammer Fault 2 (LW800 Only)
53	Bottom of Form Chan 8	107	Power Fault 2 (LW800 Only)
54	Bottom of Form Chan 12	108	Printer is LW800 (Not LW400)
	P "DIGIT"		PERF SKIP LENGTH (FLC MODE ONLY)
	L "ONE THRU THREE DIGITS"		NO. OF LINES PER PAGE (FLC MODE ONLY)
	M "ONE THRU THREE DIGITS"		LINE LENGTH IN COLUMNS
	F "ONE THRU THREE DIGITS"		ALMOST FULL THRESHOLD (X16)
	E "ONE THRU THREE DIGITS"		ALMOST EMPTY THRESHOLD (X16)

DIAGNOSTIC TEST REQUEST

The diagnostic request will cause the interface to run a number of diagnostic routines to check the functionality of its circuitry. This request is encoded as:

1B5025(P)1B5C (Hex) (seven bit characters)

or 9025(P)9C (Hex) (eight bit characters)

Where (P) is the ASCII parameter number of the diagnostic test to be performed as follows:

TEST 1. Echo all received characters back to the host without printing or performing any commanded functions.

TEST 2. Echo all received characters back to the host and perform all commanded functions.

NOTE

WHILE IN THE ECHO MODE, THE PRINTER WILL NOT CHECK THE CLEAR TO SEND LINES PRIOR TO TRANSMISSION OF DATA. SYNC CHARACTERS, WHEN IN THE SYNC MODE, WILL NOT BE ECHOED. IN ADDITION, WHEN THE IGNORE NUL/DEL CODES WITHOUT ECHO OR S.O. CONVERSION OPTION IS SET, THESE CODES WILL NOT BE ECHOED.

TEST 3. Exit echo mode.

The printer may interrupt the echo data to respond to the received characters (e.g. status response or XON/XOFF may be inserted in the echo stream if enabled and detected).

TEST 4. Execute all I/O power on tests and setup operations (e.g. ROM check, RAM check, buffer check and clear, etc.). The I/O adapter will be left in its initialized state. The VFU buffer will not be changed.

TESTS 5 & 6. These diagnostic codes are reserved for internal use only. They are not to be sent to the printer by the user.

HALF LINE FEED

This function will act the same as a line feed (LF) command except that paper will be moved one half line feed (1/12 inch) of paper motion. This code is only valid in Forms Length Control mode with no VFU loaded, when the printer's internal line counter is not active (on printers which have this feature), and only when operating in 6 lines per inch vertical pitch. The function is encoded as:

1B4B (Hex) (seven bit characters)

or 8B (Hex) (eight bit characters)

OPTIONS

The printer interface options are generally selected from the Control Panel under customer engineer (CE) control or operator control. The CE has access to all option selections and the operator has access to the horizontal tabs set, vertical tab set, and the internal, local, on remote loopback test modes. In addition, the CE may allow operator access to certain other Control Panel setup options.

The CE gains access to the option setup mode by a switch on the Personality Module 1PC1. The Step Option switch on the Control Panel then advances through each possible option in numerical sequence. The Option Select switch is used to select or deselect the option by cycling through all possible settings for that option (i.e. either YES/NO (Y/N) or a number entry). Advancing the Step Option switch will enter the current setting. All CE option settings are stored in non-volatile memory. Standard operator option settings (Horizontal Tab and Vertical Tab) will revert to default values when power is removed. CE options which have been assigned to the operator will be stored in the non-volatile memory.

INTERFACE CONTROL PANEL (Figure 5-17)

The interface control panel is part of the main control panel and uses 4 of the adapter assigned control panel push buttons; the 2 upper push button switches contain LED indicators to provide interface fault indication and I/O Buffer Loaded indication. The operator option setup modes are selected by 3 control panel DIP switches located on the right side of the Control Panel. The main control panel is documented in Section II.

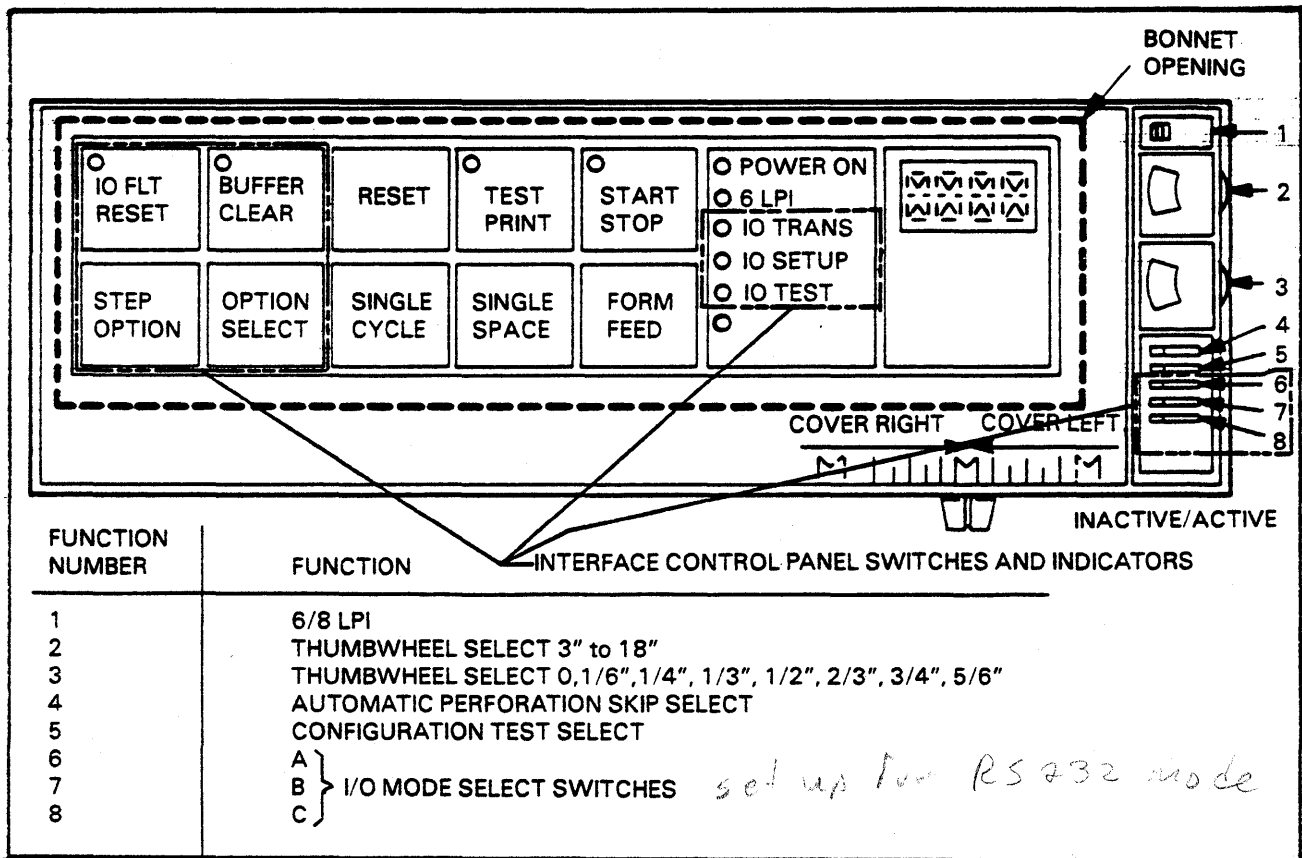


FIGURE 5-17. INTERFACE CONTROL PANEL

Step Option Switch

This switch is active when one of the Option Setup modes is selected by setting one or more of the I/O Mode Select Switches on the control panel. When activated, the switch will step through the setup option sequence. If held for more than one second continuously, the option sequence numbers will automatically step at increased speed. Upon reading the last option sequence number, the sequence will fold back to the start and continue to sequence. The sequence number will be displayed on the two left most digits of the control panel's alpha numeric display.

Option Select Switch

This switch is used to cycle through all the possible option select/deselect (y/n) or numeric codes available to be set for the particular setup mode as selected by the STEP OPTION switch. If held for more than one second, the option select numbers/characters will automatically step at increasing speed until the switch is released or a previously set Vertical Tab or Horizontal Tab has been reached.

The option select number/character will be displayed in the 2 right-most digits of the alpha-numeric display. Operation of the Step Option switch will cause the currently displayed option to be set prior to stepping to the next option.

NOTE

THIS SWITCH WILL NOT FUNCTION ON CERTAIN OPTIONS DEPENDING ON WHETHER THE CE HAS ASSIGNED THEM TO BE OPERATOR ACCESSIBLE.

I/O Fault Reset Switch

This switch will clear any interface related faults which are operator correctable. This switch is active only in the normal operating mode (when the CE switch on the personality module is in the OFF position).

The LED indicator associated with this switch will be lit when an I/O fault has been detected.

Buffer Clear Switch and Indicator

This switch is used to clear the I/O Buffer memory. The indicator is lit when any unprocessed data is in the I/O Buffer. This function can be disabled by a Control Panel option setting. Note: If the Almost Full condition exists when the buffer is cleared, the Almost Empty pacer will not be sent until the START switch is operated. In addition, since the printer will always accept data, the buffer active indicator may not extinguish if new data is sent immediately following a Buffer Clear operation.

I/O Transfer Indicator

This LED indicates that characters are being received or transmitted across the serial interface. It is extinguished if no data has been received within the time set by the "no activity" timer.

I/O Set-Up Mode Indicator

This LED indicates that the I/O Mode Select DIP switches have been set to one of the operator or CE setup modes.

I/O Test Mode Indicator

This LED indicates that the I/O mode select dip switches have been set to one of the loopback test modes. See the Operator Cards.

I/O Mode Select Switches

These dip switches are located on the right side of the control panel and are used to select the following I/O modes: The printer must be Off Line to change any of these modes and settings. It is also recommended that the I/O Buffer be empty when changing operational modes and options. The following I/O modes are documented in the Operator Cards (Interface Options section) beneath the printer's bonnet and are listed as follows:

SWITCH SETTING			MODE
A	B	C	
0	0	0	Normal Operation
0	0	1	Setup Operator Options Mode
0	1	0	Setup Horiz Tab Stops Mode
0	1	1	Setup Vertical Tab Stops Mode
1	0	0	Internal Loopback Test Mode
1	0	1	Local Loopback Test Mode
1	1	0	Remote Loopback Test Mode
1	1	1	Assign Operator Access to Setup Options Mode

0 = SWITCH OFF POSITION
1 = SWITCH ON POSITION

Mode 0 - Normal Operation: In this mode, the Step Option and Option Select switches will be disabled, the Test Mode and Setup Mode LEDs will be off, and the alphanumeric display will not be under adapter control unless an I/O fault occurs.

Mode 1 - Operator Selectable Options: In this mode, the operator may setup certain options using the Step Option and Option Select switches, along with the 4 character alphanumeric display. The selection of options available to the operator by this procedure will be defined by the Field Engineer (CE) at installation time, by means of the CE Options Setup procedure.

The Step Option switch allows all CE options to be displayed by sequencing the Step Option Switch, but only those options which have been assigned to the operator by the CE will respond to operation of the Option Select switch. See Interface Installation (CE) Set-Up Options for a description of the CE interface options and the display associated with the option.

Mode 2 - Set-Up Horizontal Tab Stops: This mode displays the print column number on the right-most three digits and an "H" (to set the horizontal tab position/s) or an "M" (to set the right margin column number) in the left-most digit. (A blank in this digit indicates no setting for that column). Operation of the Step Option switch will cause the column number display to advance until the switch is released or the next HT stop setting "H" or the right margin setting "M" is reached. The operation of the Option Select switch will cause the left digit to cycle the "H", "M" and blank settings. Advancing to the next column will leave the last column set to the status indicated. The display will advance at increased speed if the switch is held for over one second. If the right margin stop is not set, the printer will set the margin to the maximum column as indicated by the main printer controller. The last entered margin "M" Stop will become the right margin, regardless of any setting beyond that column. The horizontal tab settings may be set from the host (except the right margin) by use of appropriate escape command sequence. The right margin setting is used to auto terminate a line of print and to determine the line length to use when performing the loopback tests. Note that the last loaded HT stops (either from Control Panel or from the interface) will take precedence.

Note that both the HT stop and the VT stop settings are volatile and will be cleared when power is removed. HT commands will cause an invalid HT load response if HT stops are not properly loaded.

Mode 3 - Set-Up Vertical Tab Stops: This mode displays the vertical forms line number on the 3 right-most digits of the alphanumeric display and a "V" (to set the vertical tab stop setting), and "F" (last line number of the form) or a blank (no stops set for that line).

Operation of the Step Option switch will cause the line number display to advance until the switch is released or the next vertical tab set position is reached. This display will advance at increased speed if the switch is held for more than one second. Operation of the Option Select switch will cause the left digit to cycle through the "V", "F" or blank display. Advancing to the next line number will leave the indicated setting in the last line position. Failure to set the last line position "F" will cause the printer to default to the last loaded EVFU forms length, or if there was no previous EVFU or VT load, to the Control Panel's Forms Length switch settings. Any tab stop settings beyond the last line position will be ignored. A Top of Form (channel 1) will be automatically inserted in the first line position when loading vertical tab stops if no previous VFU load had been completed.

Vertical tab settings may be set from the host by loading an appropriate DAVFU sequence containing channel 3 (or optional channel 4-set by a CPU board DIP switch) information.

Note that both the HT stop and the VT stop settings are volatile and will be cleared when power is removed.

Modes 4, 5 and 6 - Loopback Tests: In the loopback modes, the standard loopback message (sliding ASCII alpha to right margin column and Line Feed (LF) X lines of print) will be sent continuously on the transmit data line while the printer is in the START mode. This data is to be returned to the printer by the appropriate host Data Communication Equipment. Operation of the Option Select switch (while in the STOP mode) will cause the test to cycle between printing and not printing of received data. The display will indicate the selected test mode prior to operation of the Start switch, as follows:

RLBK	Remote Loopback Without Print
RLBP	Remote Loopback With Print
LLBK	Local Loopback Without Print

LLBP	Local Loopback With Print
ILBK	Internal Loopback Without Print
ILBP	Internal Loopback With Print

When in the nonprinting mode, the display will continue to indicate the test mode if the loopback data is properly received and both modes will indicate "I/O FAULT" (LED) and "LBER" (on the control panel's display) if improperly received. The test may be restarted following an error by operating the I/O Fault Reset switch. A change of Test Mode (via the DIP switches) will cause the error indications to clear.

Mode 4 - Internal Loopback Test: This mode will wait for the start mode then route the sliding alpha/LF lines of print pattern from the transmit line back to the receive line internal to the printer. The LL (Local Loopback) and RL (Remote Loopback) signals will not be active.

Mode 5 - Local Loopback Test: This mode will wait for the start mode then activate the Local Loopback (LL) signal, wait for the Test Mode (TM) signal and then send the loopback test pattern to the local Data Communication Equipment on the transmit data line and monitor the receive data line for the exact pattern to return.

Mode 6 - Remote Loopback Test: This mode operates the same as the Local Loopback test except that the Remote Loopback (RL) line is activated by the printer and that the remote Data Communication Equipment is to return the data to the printer.

Mode 7 - Display All Options: This mode allows the Step Option switch to cycle through all CE options and display their respective setting status.

The Option Select switch is inactive unless the CE setup switch on the Personality Module is active. In this mode, the CE may assign selected set-up options to operator control by operating the Option Select switch. The display will not show the current setting status in this mode, but will show "OP" in the right-most digits when the operator can access and change the option and "CE" when only the CE may change the option setting. The left 2 digits will display the option number as usual. The operator or CE must use mode 1 to change any options previously assigned as operator changeable.

INTERFACE INSTALLATION (CE) SET-UP OPTIONS

These options may be setup by the CE by setting a switch on the Personality Module to enter this mode. Refer to the Set-Up and Reference Manual for switch location and option installation. The operator may be given access to selected options by using the I/O Mode Select switches "Mode 7" while in the CE setup mode. Certain hardware related interface options (e.g. RS-232, RS-423, RS-449, current loop, etc.) are not implemented by Control Panel programming.

The printer may be reset to the default options when the CE switch on the Personality Module is ON by holding both the Step Option and the Option Select switches ON while powering the printer up. These default conditions will then be permanently set until changed by the operator or CE. The option numbers, status and default settings are shown in Table 5-13. These default settings may vary for specific customers' requirements. A description of the option number follows the Table.

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TABLE 5-13. OPTION DESCRIPTION

DISPLAYED OPTION NUMBER	DESCRIPTION	DISPLAYED OPTION STATUS	DEFAULT OPTIONS
*01	Reserved		
*02	Auto New Line On Carriage Return	Y/N	N
*03	Lower to Upper Case Translate	Y/N	N
*04	Auto New Line On Right Margin	Y/N	Y
*05	SO/SI Enable	N/LA/LB/F	N
*06	Convert Vertical Tab to Line Feed	Y/N	Y
*07	Invalid Control Code Substitute Character Code	00 - FF	FF
*08	Invalid Control Sequence Substitute Character Code	00 - FF	FF
*09	Transmission Error Substitute Character Code	00 - FF	FF
*10	Substitute on Invalid Control Code	Y/N	Y
*11	Substitute on Invalid Control Sequence	Y/N	Y
*12	Substitute on Transmission Error	Y/N	Y
*13	Sound Bell on Invalid Control Code	Y/N	Y
*14	Sound Bell on Invalid Control Sequence	Y/N	Y
*15	Sound Bell on Transmission Error	Y/N	Y
*16	Halt on Invalid Control Code	Y/N	N
*17	Halt on Invalid Control Sequence	Y/N	N
*18	Halt on Transmission Error	Y/N	N
19	Monitor Data Set Ready	Y/N	N
20	Monitor Received Line Signal Detector	Y/N	N
21	Drop Data Terminal Ready on printer off line	Y/N	Y
22	RTS with wait for CTS (Half Duplex)	0	
	RTS W/O wait for CTS (Half Duplex)	1	
	Constant RTS with wait for CTS	2	
	Constant RTS with out wait for CTS	3	
	No RTS with wait for CTS	4	
	No RTS with out wait for CTS	5	2
23	Reverse Channel Enable (Almost Full=Off)	Y/N	N
24	Invert Reverse Channel (Almost Full=On)	Y/N	N
25	Send X-ON/X-OFF Enable	Y/N	Y
26	Break Enable	Y/N	N
27	Auto Answer Enable	Y/N	N
28	Parity Enable	Y/N	Y
29	Odd/Even Parity	O/E	O
30	Synchronous Mode	Y/N	N
31	Sync Transmit Mode with External Clock	Y/N	N
32	Pacers follow Start/Stop	Y/N	N
33	Select Baud Rate	11, 15, 30, 60, 12, 18, 24, 48, 96, 19	96
34	Data Byte Bit Length	7/8	7
35	Number of Stop Bits	1, 1.5, 2	1
36	Set Buffer Almost Full Threshold (X 16 Dec or 10 Hex)	00 - FF	10
37	Set Buffer Almost Empty Threshold (X 16 Dec or 10 Hex)	10 - FF	10
38	Set Carrier Dropout Time Limit (Seconds)	0 - 15	00
39	Set No Activity Timer (Seconds)	0 - 99	00
40	Set Data Terminal Ready Off Timer (Seconds)	0 - 7	00
*41	Translate on 48 Character Set Print Band	Y/N/NA	N
*42	Translate on 64 Character Set Print Band	Y/N/NA	N
*43	Translate on 96 Character Set Print Band	Y/N/NA	N
*44	Translate on 128 Character Set Print Band	Y/N/NA	N
*45	Enable Control Panel Buffer Clear Switch	Y/N	Y
46	Set Number of Sync Characters	1/2	1
47	Set Sync Character Code	00 - FF Hex	16
*48-52	Reserved		
53	Auto Start	Y/N	N
54	Immediate Status Response	Y/N	N
55	Ignore NUL/DEL Codes Without Echo or SO Conversion	Y/N	Y

* May be assigned to be operator changeable by the CE. *set switch*

INTERFACE OPTION DESCRIPTION

Auto New Line On CR (Option Number 2)

When selected, the printer will perform a Line Feed function after the print position has moved to the first active position (column 1) on the current print line.

Lower To Upper Case Translate (Option Number 3)

When selected, ASCII codes 60 to 7F (lower case characters) will be translated into ASCII codes 40 to 5F (upper case characters), respectively.

Auto New Line On Right Margin (Option Number 4)

When selected, the printer will automatically insert a LF (Line Feed) code (OA Hex) in the first position after the maximum line length, if that character is not a control code. If not selected, the printer will ignore all data until a valid line termination code is received, go not ready, and display an I/O line overflow status.

SO/SI Enable (Option Number 5)

The printer SI/SO option has four selections which are displayed as "N" (Not Enabled), "LA" and "LB" (Limited Enable), and "F" (Full Enable). The Full Enable reacts to all received codes and the Limited Enable reacts only to codes 21 thru 7E (hex) for "LA", or codes 20 thru 5F (hex) for "LB".

When the SO/SI (Shift Out/Shift In) option is enabled, and SI is transmitted by the data source, it indicates that the characters that follow are interpreted according to the ASCII code set. The SI code control character is to be used only after a SO character has been transmitted. A second SI code will be ignored. The SI character will cause all following character's bit 8 to be reset to a logical (0) after a SO code had caused it to go to a logical (1). If SO/SI option is not enabled, the SI and SO character will be ignored.

NOTE

A 128 OR 192 CHARACTER ROM AND CORRESPONDING PRINT BAND MUST BE INSTALLED IN THE PRINTER IN ORDER TO MAKE USE OF THIS FEATURE

Convert VT To LF (Option Number 6)

When selected, the printer will convert any received vertical tab control code into a line feed paper motion.

Invalid Control Code Substitute Character Code (Option Number 7)

This character will be substituted for received invalid control codes when the invalid control code mode is selected.

Invalid Control Sequence Substitute Character Code (Option Number 8)

When selected, the printer will convert any invalid control sequence to this character.

Transmission Error Substitute Character Code (Option Number 9)

This character will be substituted for any received character which has exhibited a framing, parity, buffer overflow, or over-run error.

Substitute On Invalid Control Codes (Option Number 10)

When selected, any control code without a defined function will be converted into the substitute character. When not selected, invalid control codes will be ignored. Invalid character codes will be converted to blank codes.

Substitute On Invalid Control Sequence (Option Number 11)

When selected, the substitute character will replace the received invalid control sequence. When not selected, all invalid control sequence characters will be ignored.

Substitute On Transmission Error (Option Number 12)

When selected, the printer will convert any received character code with framing, parity, buffer full or over-run error to the substitute character code. When not selected, these characters will be treated as null codes (ignored).

Sound Bell On Invalid Control Code (Option Number 13)

When selected, the audible alarm will be activated for 1 second when an invalid control code is received.

Sound Bell On Invalid Control Sequence (Option Number 14)

When selected, the audible alarm will be activated for 1 second when an invalid control sequence is detected.

Sound Bell On Transmission Error (Option Number 15)

When selected, the audible alarm will be activated for 1 second when a transmission error is detected.

Halt On Invalid Control Code (Option Number 16)

When selected, the I/O will drop the Data Terminal Ready line and generate an I/O fault when an invalid control code is received.

Halt On Invalid Control Sequence (Option Number 17)

When selected, the I/O will drop the Data Terminal Ready line and generate an I/O fault when an invalid control sequence is received.

Halt On Transmission Error (Option Number 18)

When selected, the I/O will drop the Data Terminal Ready line and generate an I/O fault when a framing, overrun, buffer overflow or parity error is detected.

Monitor Data Set Ready (DSR) (Option Number 19)

When selected, the printer will ignore any Data Communication Equipment signals until Data Set Ready goes ON. If not selected, the printer will act as though it is always ON.

Monitor Received Line Signal Detector (RLS) (Option Number 20)

When selected, the printer will ignore any Data Communication Equipment signals until the RLS goes ON. If not selected, the printer will act as though it is always ON.

Drop Data Terminal Ready (DTR) (Option Number 21)

When selected, the printer will place the Data Terminal Ready signal in the OFF condition when it is not in the Ready state. The printer will be not ready due to fault, halt on transmission error (if optioned), off line, or paper out conditions. If not selected, the printer will not drop Data Terminal Ready unless a selected Received Line Signal Detector or No Activity time out occurs when in the Auto Answer mode.

Request To Send/Clear To Send (RTS/CTS) (Option Number 22)

The following combinations of Request To Send and Clear To Send may be selected when the printer has status or data to send:

SETTING NUMBER	FUNCTION
0	After Received Line Signal Detector & Clear To Send are OFF, set Request To Send, then wait for Clear To Send ON (Half Duplex)
1	After Received Line Signal Detector is OFF, set Request To Send and send data without waiting for Clear To Send (Half Duplex)
2	Set constant Request To Send, wait for Clear To Send
3	Set constant Request To Send and Send without waiting for Clear To Send
4	Keep Request To Send off and wait for Clear To Send
5	Keep Request To Send off and send without waiting for Clear To Send

NOTE

IN HALF DUPLEX MODE (SETTING 0,1) THE RECEIVED LINE SIGNAL DETECTOR SIGNAL MUST REMAIN ON FOR A MINIMUM OF 200 US AFTER THE STOP BIT OF THE LAST CHARACTER TRANSMISSION.

Reverse Channel (SCA/SRS) (Option Number 23)

When selected, the printer will place the Reverse Channel Line in the OFF condition when the interface buffer reaches the Almost Full condition, it will then remain off until the buffer reaches the Almost Empty condition. If it is not selected, it will be held in the ON condition continuously. The Almost Full/empty thresholds may be programmed.

Reverse Channel Polarity Change (Invert Reverse Channel) (Option Number 24)

When selected, the Reverse Channel signal will be active ON instead of OFF.

Send X-ON/X-OFF (Option Number 25)

When selected, the printer will send the X-OFF (Hex 13-DC3) code on the Transmitted Data Line when the interface buffer reaches Almost Full and then send XON (Hex 11-DC1) when the interface buffer is below Almost Empty. If the monitor Received Line Signal Detector (Option 20) and/or Data Set Ready (Option 19) are selected but are not active, the X-ON/X-OFF codes will not be sent. Neither code will be sent twice in succession. An initial X-ON code will be sent following power on or if an option change if the above Received Line Signal Detector and Data Set Ready conditions allow it. See Table 5-14.

NOTE

X-ON/X-OFF WILL NOT BE USABLE WHEN THE HALF DUPLEX MODE (OPTION 22 = 0 or 1) IS SELECTED.

Break Enable (Option Number 26)

When selected, the printer will place a continuous space (ON) state on the primary Transmitted Data line when the interface buffer reaches Almost Full (selectable threshold) state, it will remain in this state until the Almost Empty (selectable threshold) condition is reached. When in this condition, no other transmissions from the printer can take place (e.g. X-ON/X-OFF status response) until the Almost Empty condition occurs.

Auto Answering (Option Number 27)

When selected, the activation of the Ring Indicator line on the first ring will cause the printer to activate the Data Terminal Ready signal and accept

input data. The printer must be placed in the Start mode to enable the Auto Answer function. The Data Terminal Ready signal will be dropped following the no activity time out (See Set No Activity Timer - Option Number 39) or the carrier (Received Line Signal Detector) time out (if the Received Line Signal Detector option is selected (See Set Carrier Dropout Time Limit - Option Number 38) following any pending printer data transmission.

Enable Parity (Option Number 28)

When selected, the printer will test all input data bytes for proper parity. Parity error codes will cause a substitute character, a halt, or an audible alarm as selected. Parity Error will be reported as a transmission error in the selected status response.

Odd/Even Parity (Option Number 29)

This option selects the odd or even parity mode for receive or transmit, if the enable parity option is selected.

Enable Synchronous Receive Mode With External Clock (Option Number 30)

When selected, the printer will receive data in the synchronous mode (See Synchronous Transmission) as clocked by the Receiver Signal Element Timing signal from Data Communication Equipment.

Enable Synchronous Transmit Mode With External Clock (Option Number 31)

When selected, with any of the send data options, the printer will transmit data in the synchronous mode (See Synchronous Transmission) as clocked by Transmit Signal Element Timing signal from the Data Communication Equipment.

When not selected, with any of the send data options, the printer will transmit data in the synchronous mode as clocked by the internal baud rate generator (programmable). The printer will send the selected clock to the Data Communication Equipment on the Data Terminal Equipment output Transmit Signal Element Timing line.

Pacers Follow Start/Stop (Option Number 32)

The following describes the operation of Data Pacing signals-Reverse Channel, X-ON/X-OFF, and Break (if optioned).

TABLE 5-14. PACING SIGNAL STATUS

WITH OPTION 32 ON			
EVENT	REVERSE CHANNEL	X-ON/X-OFF	BREAK
At Power On	OFF	NOT SENT	ON
Just after ON LINE	ON	X-ON SENT	OFF
At Almost Full	OFF	X-OFF SENT	ON
At Almost Empty	ON	X-ON SENT	OFF
Just before OFF LINE	OFF	X-OFF SENT (If not already Almost Full)	ON
WITH OPTION 32 OFF			
EVENT	REVERSE CHANNEL	X-ON/X-OFF	BREAK
At first ON LINE following power-on	ON	X-ON SENT	OFF
At Almost Full	OFF	X-OFF SENT	ON
At Almost Empty	ON	X-ON SENT	OFF

NOTES:

IF IN ECHO MODE, ALL PACERS WILL ACTIVATE WHEN DTR (DATA TERMINAL READY) TURNS OFF. NO ECHO WILL TAKE PLACE UNTIL DTR TURNS ON. DATA MAY BE LOST IF THE HOST ALLOWS THE BUFFER TO OVERFLOW.

IF A SEND STATUS IS IN PROCESS WHEN ALMOST FULL OCCURS, REVERSE CHANNEL (IF OPTIONED) WILL TURN OFF IMMEDIATELY. THE BREAK, OR X-ON/X-OFF CONDITIONS WILL WAIT UNTIL THE SEND STATUS IS COMPLETED.

DTR IS ON WHEN THE PRINTER IS ON LINE WITH NO FAULTS (OR WHILE OPTION 21 IS IN THE ON MODE) EXCEPT THAT WHEN IN THE AUTO ANSWER MODE, DTR ON REQUIRES THAT THE RING SIGNAL BE ALSO RECEIVED TO ALLOW DTR TURN ON.

THE SETTING OF OPTION 21 (DTR OFF ENABLE) WILL NOT AFFECT THE TURN ON OR OFF TIMING OF THE PACER SIGNALS.

THE THREE PACERS ARE MUTUALLY EXCLUSIVE-ONLY ONE SHOULD BE SELECTED AT A TIME.

Select Standard Baud Rate (Option Number 33)

These control panel setup numbers allow the user to select one of the following standard baud rates for both the asynchronous and synchronous receivers and transmitters:

NUMBER	BAUD RATE
11	110 baud (async only)
15	150 baud (async only)
30	300 baud
60	600 baud
12	1200 baud
18	1800 baud
24	2400 baud
48	4800 baud
96	9600 baud
19	19200 baud

Byte Length (Option Number 34)

These control panel setup numbers are encoded to select the desired number of bits in the Received and Transmitted byte (7 or 8). These do not include the parity, stop, or start bits.

Number Of Stop Bits (Option Number 35)

These control panel setup numbers are encoded to select the desired number of stop bits to be sent when the printer is in the asynchronous output mode.

NUMBER	NO. OF STOP BITS
1	1
15	1-1/2
2	2

Set Buffer Almost Full Threshold (Option Number 36)

This option selects the number of empty locations remaining in the buffer to establish the Almost Full threshold in multiples of 16 for reporting via XOFF, Reverse Channel or Break.

Set Buffer Almost Empty Threshold (Option Number 37)

This option selects the number of unprocessed characters remaining in the buffer to establish the Almost Empty threshold in multiples of 16 (10 Hex) for reporting via XON, Reverse Channel or break. Note that this threshold is forced to be no less than 256 bytes (10 Hex X 10 Hex or 16 Decimal X 16 Decimal). This threshold should never be set to a larger number than the almost full threshold.

Set Carrier Dropout Time Limit (Option Number 38)

This feature is used when the Auto Answer option is enabled. It allows the user to set the length of time in seconds (range is 0 to 15 seconds - time out error is less than +132 ms plus 5% of time setting) that the Received Line Signal Detector signal will drop from ON to OFF, before the printer turns the Data Terminal Ready signal OFF and returns to the idle, monitoring mode.

If set to zero, (00) the printer will not monitor the carrier (RLSD) signal line for dropout, nor will it drop the DTR signal line. This will not affect the monitor RLSD option which may reject data received if the carrier is not present.

Set No Activity Timer (Option Number 39)

This feature is used when the Auto Answer option is enabled. It allows the user to set the length of time in seconds (range is 0 to 99 seconds - time out error is less than +132 ms plus 5% of time setting) that the Data Terminal Ready signal should stay ON before it is turned OFF to disconnect the call when no data is received.

If set to zero (00), the printer will not monitor the data for no activity, nor will it drop the DTR line.

If both the Carrier Dropout Timer and the No Activity Timer are set to zero (00), in the Auto Answer Mode, the call may never be terminated.

Set Data Terminal Ready (DTR) Off Timer (Option Number 40)

This feature is used when the Auto Answer option is enabled. It allows the user to set the length of time in seconds (range is 0 to 7 seconds - time out error is less than +132 ms plus 5% of time setting) that the Data Terminal Ready line once it is turned OFF should remain OFF to allow the call to completely disconnect before it may be turned back ON.

Select Translation On 48, 64, 96 Or 128 Char Bands (Option Numbers 41 thru 44)

These features select the optional code translation PROMS if the selected band is detected as installed on the printer. The translate mode cannot be selected if no translate PROMS are installed. (The display will always indicate NA in this case).

Enable Control Panel Buffer Clear Switch (Option Number 45)

This switch is used to clear the I/O Buffer memory. The indicator is on when any unprocessed data is in the I/O Buffer. This function can be disabled by a control panel option setting (Option Number 45). Note: If the Almost Full condition exists when the buffer is cleared, the Almost Empty pacer will not be sent until the START switch is operated. In addition, since the printer will always accept data, the buffer active indicator may not extinguish if new data is sent immediately following a buffer clear.

Set Number Of Sync Characters (Option Number 46)

The printer will transmit (or hunt) for one or two Sync Characters when this option is selected and then send (receive) a 7 or 8 data bit character (programmable), and a parity bit (if enabled). The start or stop bits are not used in the synchronous mode. When a parity or overrun error is detected, the printer will start a new hunt sequence. This means that data following the error may also be lost.

Set Sync Character Code (Option Number 47)

The printer may also be programmed to send and receive synchronous data at bit rates of 300 to 19,200 using an internally generated clock. This clock may be optionally sent out on the Transmitter Signal Element Timing line to allow the Host (Data Communication Equipment) to synchronize with the printer (DTE).

NOTE

WHEN IN THE SYNCHRONOUS MODE, THE HOST SHOULD MAINTAIN SYNC CHARACTER TRANSMISSION EVEN WHEN NOT SENDING DATA, OTHERWISE THE PRINTER WILL WAIT UNTIL THE NO ACTIVITY TIMER TIMES OUT TO HUNT AGAIN FOR SYNC.

Option Numbers 48 Thru 52

These options are reserved for future assignment.

Auto Start (Option Number 53)

When this option is selected, the printer will automatically go On Line following power up if no faults exist.

Immediate Status Response (Option Number 54)

When this option is selected and when the printer is Off Line, it will respond to all incoming Status Request commands immediately. The Status Request

will also be stored in the printer's buffer. This allows the printer to respond to the Status Request when it is encountered in the data stream after the printer is placed On Line (unless the buffer is cleared). The printer will always respond with immediate Status Response if it is Off Line and a fault is detected regardless of the setting of this option. When the printer is On Line, it will respond only when the Status Request is encountered in the data stream.

Ignore NUL/DEL Codes Without Echo or S.O. Conversion (Option Number 55)

When this option is selected, the printer will discard all NUL (00 hex) and DEL (7F hex) control codes unconditionally. When this option is not selected, the NUL and DEL codes will be retained for the Echo or Shift Out conversion purposes before being discarded. NUL or DEL codes must not appear within Escape Sequences.

TRANSMITTERS, RECEIVERS AND I/O CONNECTORS:

Transmitters, receivers, and I/O connectors may be changed by changing the I/O connector pc board. Maximum data rates and cable length requirements are specified in the appropriate EIA standard.

RS-232C INTERFACE

The standard printer is equipped with a set of RS-232C transmitters and receivers as shown in Figures 5-18 and 5-19. Table 5-15 defines connector pin assignments and Figure 5-20 shows the 25 pin "D" type connector used in the RS-232C configuration.

RS-422/423 INTERFACE (RS-449)

The RS-422/423 I/O connector pc board is equipped with transmitters and receivers as shown in Figures 5-21 thru 5-23. All category I signals use isolated return pins at the printer end. In RS-423 single ended transmit mode, these returns are connected to the printer's Send Common (SC) line. All category II received signals Test Mode (TM) and Incoming Call (IC) use the Receive Common (RC) line as a common return in both RS-422 and RS-423 modes. In the RS-422 category I mode, the transmitter is as shown in Figure 5-22 and is balanced, differential with completely isolated, ungrounded returns. All category II signals (Remote Loopback (RL), Local Loopback (LL) and Secondary Request to Send (SRS)), require the RS-423 transmitters even though they may be used in an RS-422 environment.

Figures 5-24 and 5-25 show the RS-449 37 pin and optional 9 pin "D" connectors. Note that the printer's panel mount connectors are equipped with female signal pins and male connector shells.

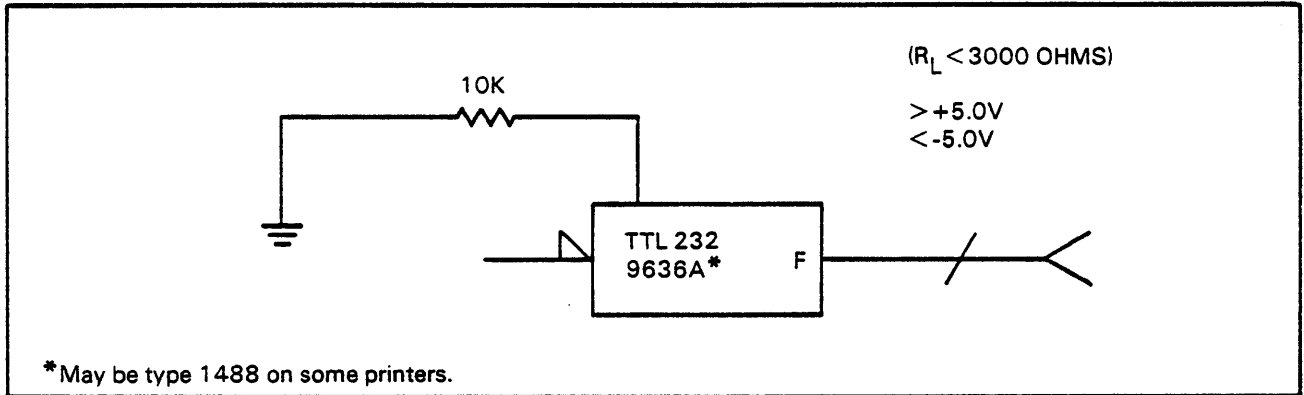


FIGURE 5-18. RS-232C TRANSMITTER

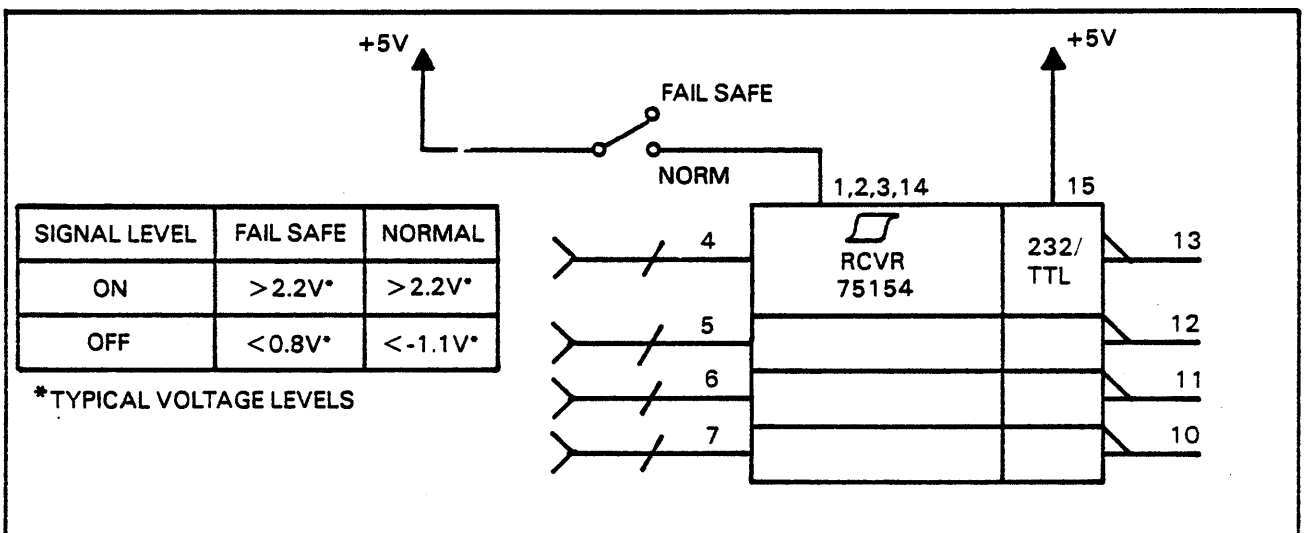


FIGURE 5-19. RS-232 RECEIVER

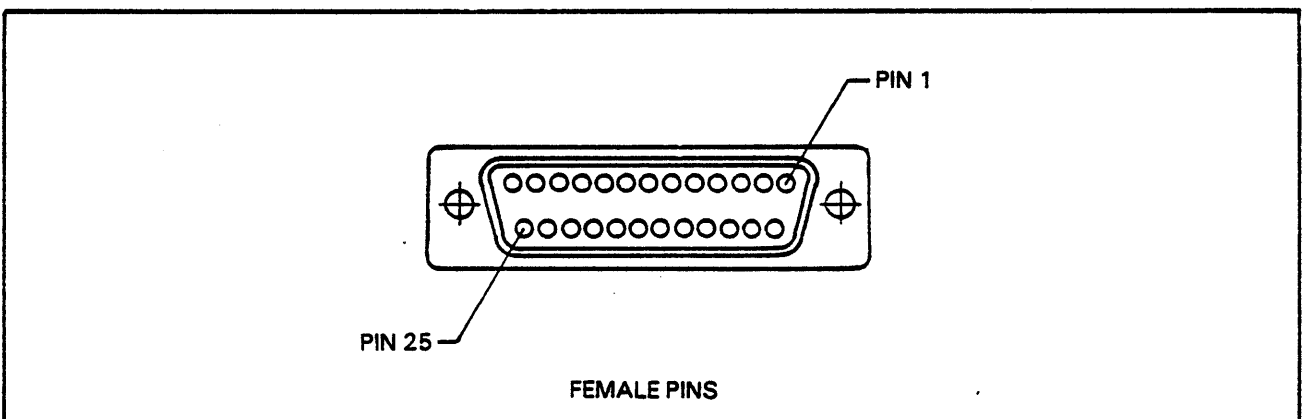


FIGURE 5-20. RS-232C 25 Pin D TYPE CONNECTOR

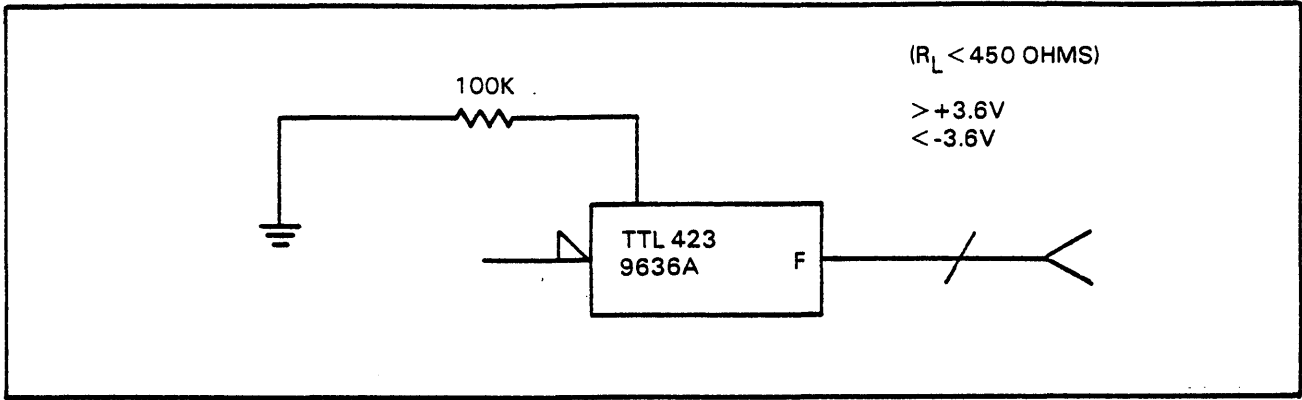


FIGURE 5-21. RS-423 TRANSMITTER

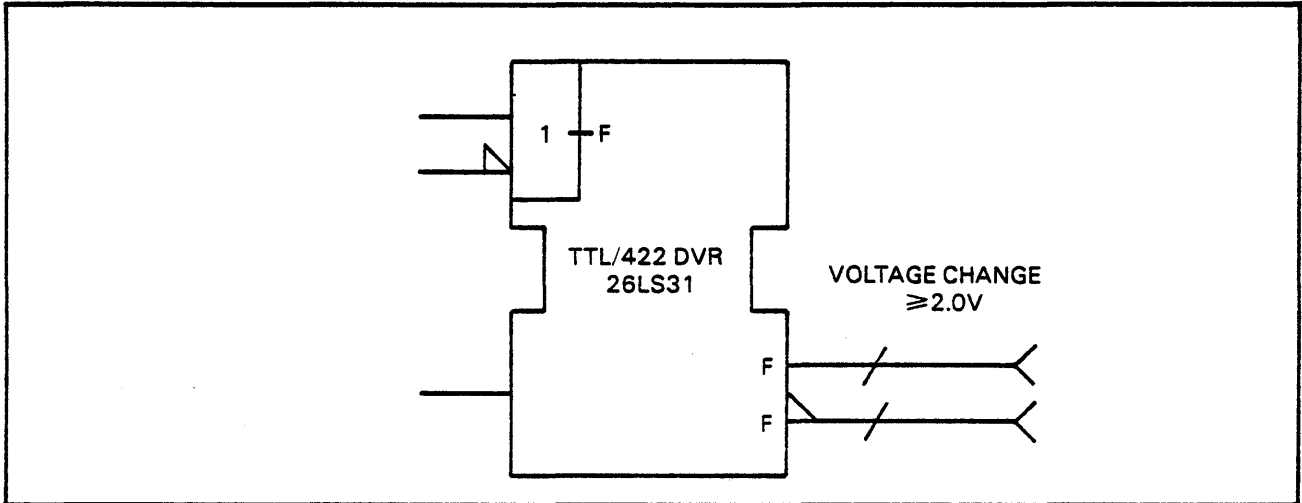


FIGURE 5-22. CATAGORY I RS-422 TRANSMITTER

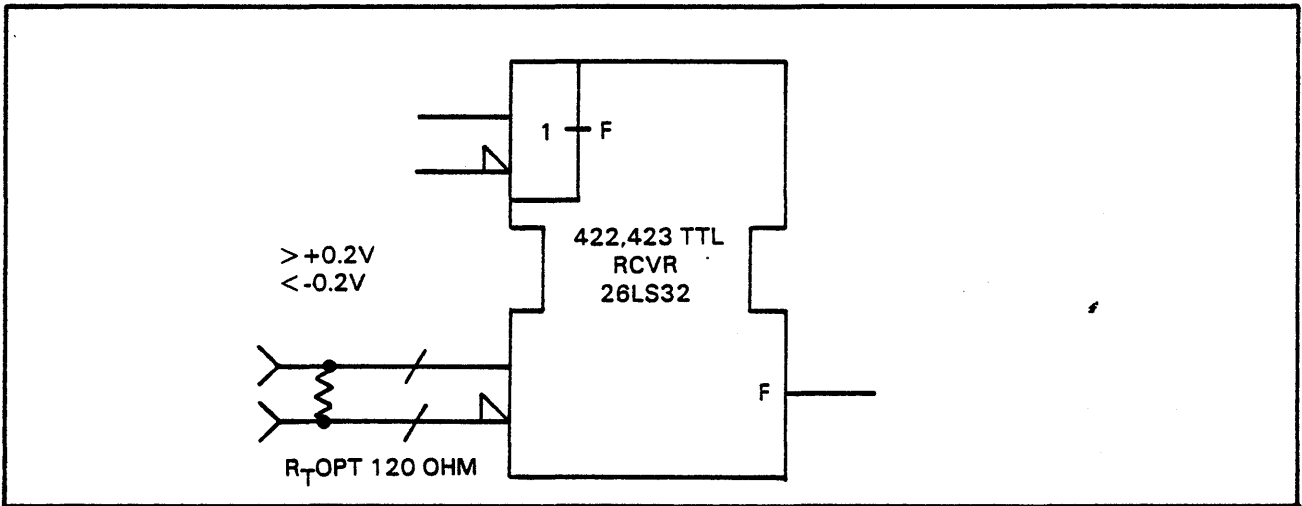


FIGURE 5-23. RS-422 AND RS-423 RECEIVER

TABLE 5-15. RS-232C/449 CIRCUITS, PIN NUMBERS AND EQUIVALENCY

CIRCUIT DIRECTIONS	CONN. PINS		EIA RS-449	CONN. PINS	EIA RS-232
	A	B			
-	19	-	SG SIGNAL GROUND	7	AB SIGNAL GND
TO DCE	37	-	SC SEND COMMON		
FROM DCE	20	-	RC RECEIVE COMMON		
-	1		SHIELD	1	AA PROTECTIVE GND
FROM DCE	15	20	IC INCOMING CALL	22	CE RING INDICATOR
TO DCE	12	30	TR TERMINAL READY	20	CD DATA TERMINAL READY
FROM DCE	11	29	DM DATA MODE	6	CC DATA SET READY
TO DCE	4	22	SD SEND DATA	2	BA TRANSMITTED DATA
FROM DCE	6	24	RD RECEIVED DATA	3	BB RECEIVED DATA
TO DCE	17	35	TT TERMINAL TIMING	24	DA TRANSMITTER SIGNAL ELEMENT TIMING (DTE SOURCE)
FROM DCE	5	23	ST SEND TIMING	15	DB TRANSMITTER SIGNAL ELEMENT TIMING (DCE SOURCE)
FROM DCE	8	26	RT RECEIVE TIMING	17	DD RECEIVER SIGNAL ELEMENT TIMING
TO DCE	7	25	RS REQUEST TO SEND	4	CA REQUEST TO SEND
FROM DCE	9	27	CS CLEAR TO SEND	5	CB CLEAR TO SEND
FROM DCE	13	31	RR RECEIVER READY	8	CF RECEIVED LINE SIGNAL DETECTOR
TO DCE	7*	9*	SRS SECONDARY REQUEST TO SEND	11/19	SCA SECONDARY REQUEST TO SEND OR REVERSE CHANNEL
TO DCE	10	37	LL LOCAL LOOPBACK	18	LOCAL LOOPBACK
TO DCE	14	37	RL REMOTE LOOPBACK		
FROM DCE	18	20	TM TEST MODE	25	TEST MODE

*IN OPTIONAL 9 PIN CONNECTOR

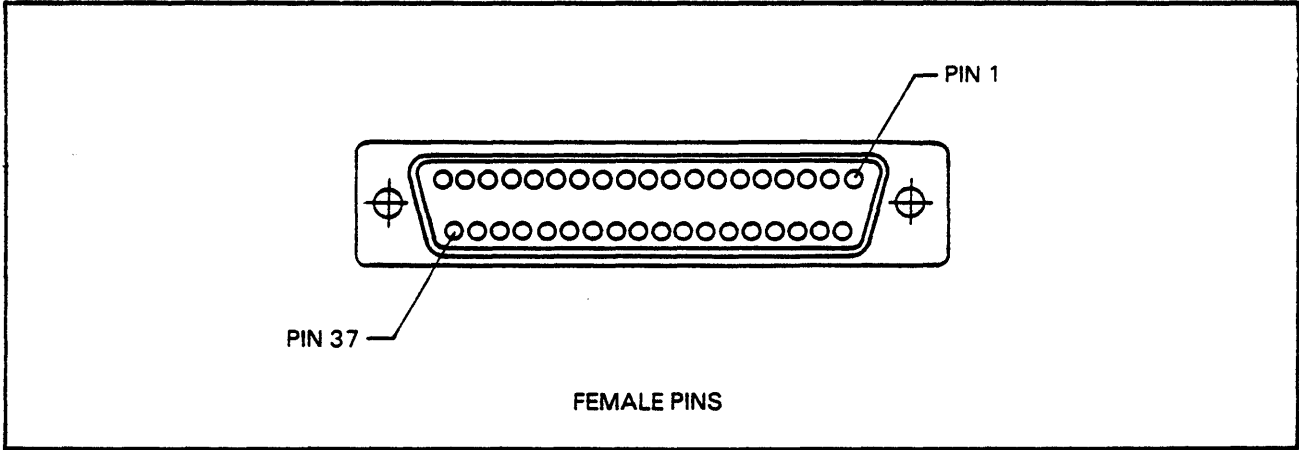


FIGURE 5-24. RS-449 37 PIN D TYPE CONNECTOR

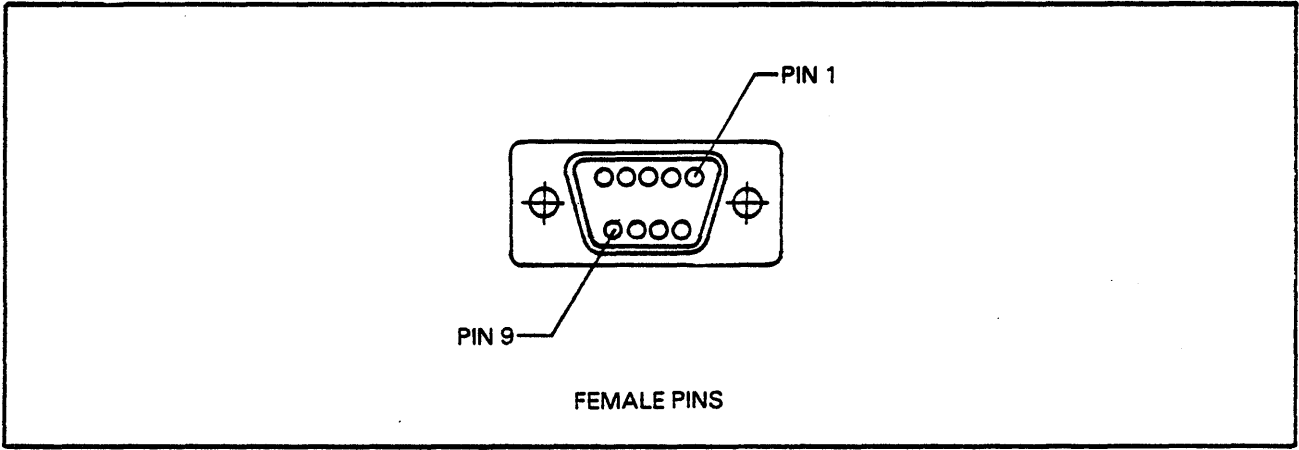


FIGURE 5-25. RS-449 OPTIONAL 9 PIN D TYPE CONNECTOR

SERIES 1 SERIAL INTERFACE PERSONALITY MODULE

The Series 1 personality module is designed to interact between the Linewriter printer and a Series 1 64K baud synchronous data communications interface and is based on the EIA RS-422 standards.

The interface functions by using two printed circuit boards: The I/O adaptor board 6PC1 which contains the receivers and transmitters, and the personality module 1PC1 which contains the logic and firmware and handles the protocol and interfacing to the printer system.

INTERFACE SIGNALS (Figure 5-26)

This section describes the interface signals associated with this interface. The signal names and pin assignments are listed in Table 5-19.

There are four interface lines used on this interface; Send Data, Receive Data, Terminal Timing and Receive Timing. The Send Data and Receive Data lines are connected to each other in the interconnection cable to provide operation in the half duplex mode. The Terminal Timing and the Receive Timing lines are also connected to each other in the cable.

Send Data will be synchronous with the Terminal Timing clock signal. The data will change on the rising (OFF to ON) edge of the Terminal Timing signal and will be sampled by the receiver on the falling (ON to OFF) edge of the Receive Timing clock signal.

DATA INTERCHANGE TECHNIQUE

The printer and host both use the data line and the timing line in a half duplex mode (they both send and receive data, but in only one direction at a time), by multiplexing each of their data and clock transmissions. The printer is normally in the re-

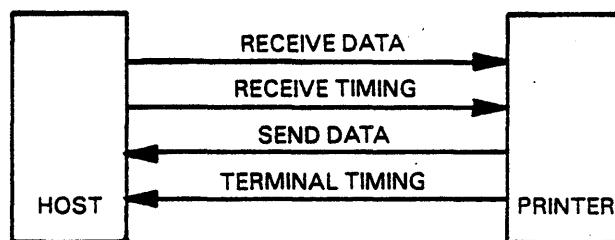


FIGURE 5-26. DATA SOURCE TO PRINTER INTERFACE LINES

ceive mode. It waits for data and the rising edge of the timing (clock) signal. Upon completion of the following sequence, SYNC, STX, DATA or ESC SEQ, ETX and CRC character, (explained in Table 5-16), the host turns off its transmitters and monitors the data and timing lines for a printer response. The printer turns off its receiver and when ready to respond, turns on its timing (clock) signal, sends at least one sync character followed by the appropriate response data. When the response is complete, the printer turns off the data and clock transmitters and the sequence is repeated. Both the host and printer will time out if a data transfer or response sequence is not completed within a reasonable amount of time.

Data sent to the printer must be of the following form: SYNC, STX, DATA or ESC SEQ, ETX and CRCL, CRCU code.

MOVE AND PRINT DATA FORMAT

All data sent to or from the printer will be sent with the least significant digit first. This interface first moves paper then prints.

When data is not an Escape Sequence, the format to print and move data is as follows:

TABLE 5-16. MOVE AND PRINT DATA FORMAT

BYTE	CHARACTER	DESCRIPTION
1	SYNC (16 Hex)	Synchronous Start
2	STX (02 Hex)	Start Text (Starts Data Block)
3	30 to 39 Hex 41 to 46 Hex (ASCII 0 thru F)	Move CMD (Move Command, move paper "N" number of lines). This is the lower nibble (least significant) of the move "N" lines command.
4	30 to 39 Hex 41 to 46 Hex (ASCII 0 thru F)	Move CMD (Move Command, move paper "N" number of lines). This is the upper nibble (most significant) of the move "N" lines command. EXAMPLE: Move paper 15 lines would be coded as 35 Hex (lower nibble), 31 Hex (upper nibble)-ASCII 5 then 1. Move paper 90 lines would be coded as 30 Hex (lower nibble), 39 Hex (upper nibble)-ASCII 0 then 9.
5 thru 209	20 thru 7F Hex	Print characters. All other codes will become blank spaces. Each print code calls out a specific print band position in the character set. The number of characters is determined by the print line length.
N	ETX (03 Hex)	End Text (Ends Data Block).
N+1	CRCL (ASCII 0 thru F)	Cycle Redundancy Check (lower nibble)
N+2	CRCU (ASCII 0 thru F)	Cycle Redundancy Check (upper nibble) These characters are the logical "Exclusive Or" of the CRC Character. It is the result of XOR'ing all characters in the STX....ETX block sequence and will produce a result of 00 Hex when XOR'd by the printer. This checks the integrity of the data.

CONTROL CODES (Table 5-18)

The printer will recognize 4 ASCII control codes. All other non printable codes between 00 Hex and FF Hex will be treated as blank characters. The valid ASCII control codes are SYNC, STX, ETX and ESC.

CODE	FUNCTION	8 BIT ASCII
SYNC	Sync Code	16 Hex
STX	Start of Text	02 Hex
ETX	End of Text	03 Hex
ESC	Escape	1B Hex

All control and data sequences must be preceded by STX and terminated by ETX, and followed by CRCL and CRCU commands before the command will be executed.

Sync Code (SYNC)

The SYNC character must be sent at least once prior to starting a STX, DATA and ETX block data transfer to the printer. SYNC must also be used for time fill between characters (if required) so that there will be no breaks during the block transfer. The order of commands for a normal text transmission would be SYNC, STX, CMD or DATA, ETX, CRCL and CRCU.

Start of Text (STX)

The STX command must be the first character (following a SYNC) of any data or commands sent to the printer.

End of Text (ETX)

The ETX command must be sent to the printer to define the end of the data or CMD (Move "N" number of lines) block.

Following the ETX command will be the CRCL and CRCU characters. The CRCL and CRCU check the transmitted block for errors. The character resulting from this, when exclusively OR'd with the exclusively OR'd result of all previous block data (including STX and ETX), should give a result of 00 Hex if the block was received correctly. The printer will return a status of transmission OK or NOK (okay or not okay) depending on this result.

If the printer does not receive a valid ETX command, the printer will be unable to act on the Data Block. A paper move command (CMD) will be executed when received regardless of the ETX command. If the printer does not detect an ETX within 2 seconds following the last character

received, (including SYNC), the entire block will be rejected and the printer will return to the receive mode and wait for a new STX....ETX transmission sequence.

Escape (ESC)

The Escape command will be the first character of a control sequence. The order of commands used for an Escape Sequence would be SYNC, STX, ESC sequence, ETX, CRCL and CRCU. Escape Sequences are to be sent in separate STX....ETX blocks, they are not to be mixed with print/move blocks. The only exception to this is the Reset To Initial State function. This may be sent in a print/move block to cancel the operation. If more than one Escape Sequence is sent in a data block, only the last one will be performed when the ETX is received. The ESC command flags the printer the information that follows is one of the following Escape Sequence Control Functions:

- a. Select Vertical Pitch
- b. Reset to Initial State
- c. Long Status Request/Response

Escape Sequence Control Functions

Select Vertical Pitch: This function allows the printer to print in either 6 or 8 vertical lines per inch (LPI). The LPI mode will be changed when the command is received. Normally it should only be changed when the form is at the top of the page (Top of Form position).

The code for the Select Vertical Pitch function is SYNC, 1B5B(P)2047 Hex, ETX, CRCL, CRCU.

Where (P) will have the value 313230 Hex for 6 LPI or 3930 Hex for 8 LPI.

Reset to Initial State: This function will cause the following to occur: All errors and pending operations will be cleared; the page length and vertical pitch will be set to the values specified by the 6/8 LPI switch and Page Length Select switches on the side of the Control Panel; and the printer will remain On Line if it was previously On Line.

It takes approximately 3 seconds for the printer to complete the Reset to Initial State routine. During this period, the printer will not respond to any commands from the Host. The Host should therefore continue to request Long or Short Status until the printer is able to respond.

The code for the Reset to Initial State is SYNC, STX, 1B63 Hex, ETX, CRCL, CRCU. The printer will not send a status to the Host following this operation.

Long Status Request/Response: This function sends a complete status report on the personality module and I/O adaptor to the Host when requested. The printer responds to the Host by turning on its data and clock transmitters and sending a variable length data block of the form: SYNC, STX, DATA (See Table 5-17), ETX, CRCL, CRCU and SYNC. The printer will then turn off its transmitters. Table 5-17 lists the statuses available and their assigned numbers with the most significant digit sent first. Status numbers will be returned when that status is active. The printer will respond to status requests while power is on when possible.

The code for the Long Status Request (from the Host) is SYNC, STX, 1B5B70 Hex, ETX, CRCL, CRCU.

The code for the Long Status Response (from the Printer) is SYNC, STX, 1B5024(PS)1B5C Hex, ETX, CRCL, CRCU. Where (PS) is the parameter string. Each parameter will consist of one to four ASCII characters and may begin with an ASCII letter. Parameters must be separated by an ASCII semicolon ";". The semicolon is not used following the last parameter.

TABLE 5-17. LONG STATUS NUMBER DEFINITIONS

STATUS CODE	PRINTER STATUS	STATUS CODE	PRINTER STATUS
0	Controller Hardware Error	36	Fuse 4 (+36 V LW400)
1	Odd Half Space	37	Fuse 5 (+36 V LW800)
2	Inhibit	38	Illegal EVFU Load Attempt
3	Horizontal Error	39	Forms Length Control Mode
4	Fuse 2 (Paper Clamp)	40	IOVFU Mode
5	Hammer Fault	41	TLVFU Mode
6	Power Fault	42	8253 Error
7	Blower Fault	43	I/O Select 6/8 Lines Per Inch
8	Stepper Fault	44	6 Lines Per Inch
9	NHOM Fault	45	8 Lines Per Inch
10	Out Of Paper	46	EVFU Loaded
11	Forms Error	47	Auto Line Feed Enabled
12	Ribbon Error	48	Auto Perf Skip Enabled
13	Gate Open	49	Vertical Tab Select Channel 3
14	Band Motor Speed Error	50	Vertical Tab Select Channel 4
15	Band Sync Error	51	Slew to Top Of Form
16	Band Error	52	Bottom of Form Channel 2
17	Paper Runaway	53	Bottom of Form Channel 8
18	Forms Less Than 3 Inches	54	Bottom of Form Channel 12
19	Forms Tape Verify Error	55	Vertical Format Error
20	Line Counter Enabled	56	Compressed Pitch
21	Line Counter Select Error	57	Standard Pitch
22	Tape Reader Error	58	48 Character Set Band
23	Data Overflow	59	64 Character Set Band
24	Format Tape Error	60	96 Character Set Band
25	No Top Of Forms	61	128 Character Set Band
26	Data Format Error	62	48 Character Set Statistical Band
27	EVFU Load Overflow	63	64 Character Set Statistical Band
28	Channel Selected, Chan Not Loaded	64	96 Character Set Statistical Band
29	Channel Selected, EVFU Not Loaded	65	192 Character Set Statistical Band
30	Illegal Channel		
31	Illegal Code		INTERFACE STATUS
32	Page Error		
33	Illegal Initialization of Processor	69	Right Margin Overflow
34	Diagnostic ROM Installed	70	Ready
35	Fuse 3 (Stepper)		

P "DIGIT" = PERF SKIP LENGTH (FLC MODE ONLY)
L "ONE THRU THREE DIGITS" = NO. OF LINES PER PAGE (FLC MODE ONLY)
M "ONE THRU THREE DIGITS" = LINE LENGTH IN COLUMNS

TABLE 5-18. SERIES 1 CHARACTER AND CODE SET

BIT POSITION				bit7 bit6 bit5	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
bit4	bit3	bit2	bit1									
0	0	0	0			sp	V	R	:	|	m	
0	0	0	1			2	W	-	<	a	n	
0	0	1	0	STX		3	X	\$	(	b	o	
0	0	1	1	ETX		4	Y	·	|	c	p	
0	1	0	0			5	Z	A	!	d	q	
0	1	0	1			6	&	B	)	e	r	
0	1	1	0		SYNC	7	,	C	:	f	⊗	
0	1	1	1			8	%	D	^	g	⊠	
1	0	0	0			9	J	E	\	h	s	
1	0	0	1			0	K	F	—	i	t	
1	0	1	0			#	L	G	>	[	u	
1	0	1	1		ESC	@	M	H	?	]	v	
1	1	0	0			/	N	I	:	~	w	
1	1	0	1			S	O	+	=	j	x	
1	1	1	0			T	P	.	"	k	y	
1	1	1	1			U	Q	'	`	l	z	

1 = OFF/OPEN (AWAY FROM THE NUMBERS)

PRINTER TO HOST SHORT STATUS RESPONSES

The printer is capable of sending Short Status Responses to the Host. The printer will process the data, perform the required operation, turn on its data and clock transmitters and respond to the Host with a 4 byte status when it has received the following:

- a. A valid STX command
- b. A move CMD and/or print data sequence
- c. An ETX command
- d. CRC Characters

The status returned to the Host consists of 2 bytes for status, called "Short Status Byte 1", and 2 bytes for current line number position, called "Short Status Byte 2". The line number will indicate the forms position following the commanded move operation. The response to the Host will be SYNC, STX, Short Status Byte L (lower nibble), Short Status Byte U (upper nibble), Line Number Byte L (lower nibble), Line Number Byte U (upper nibble), ETX, CRCL, CRCU. Short Status Response will also follow a Select Vertical Pitch Escape sequence.

Short Status Byte 1

There are 8 statuses which can be sent from the printer to the Host:

BIT NUMBER STATUS

- | | |
|---|----------------------------------|
| 1 | Printer Not Ready |
| 2 | Out of Paper |
| 3 | Transmission Error |
| 4 | Command Error |
| 5 | Move Error |
| 6 | Print Error |
| 7 | Invalid Print Character Received |
| 8 | Printer Fault |

Set = 1 = Logic High

Printer Not Ready: When this bit is set, the printer was unable to accept the print and/or move data because of a fault or an Off Line (Stop) condition.

Out of Paper: When this bit is set, the printer has detected an out of paper condition.

Transmission Error: When this bit is set, the printer has detected an over-run condition or a CRC error. No print or Escape Sequence data will be processed when this error is detected. The move command (CMD) and the next two bytes following STX will be attempted without regard to the CRC, ETX or time out result.

Command Error: When this bit is set, the printer has received an illegal control code, a move command error, more than one STX without an ETX, or an illegal ESC sequence, and the command will not be processed.

Move Error: When this bit is set, the printer has detected a fault during a paper move operation.

Print Error: When this bit is set, the printer has detected a fault during a print operation or an input data buffer overflow has occurred. Overflow is defined as exceeding the print line right margin limit (132 characters in standard pitch, 204 characters in compressed pitch). When an overflow is detected, the print operation will not occur.

Invalid Characters Printed: When this bit is set, the printer has detected one or more print characters outside the range of 20 Hex thru 7F Hex and has printed a space (blank) in that position. The line can be reprinted by over-printing the line without a paper move command.

Printer Fault: When this bit is set, the printer has detected a non-recoverable fault and requires either operator or C.E. intervention. When the interface detects a non-recoverable fault, the Control Panel will display "IOER".

Short Status Byte 2

These bytes represent the current line on the page (1 thru 60 Hex) in ASCII format. These bytes follow Short Status Byte 1. The first byte sent of the Short Status Byte 2 transmission is the lower nibble, the second byte sent is the upper nibble. For example, if the current line position is on line 38, the printer would send 38 Hex for the lower nibble and 33 Hex for the upper nibble (ASCII 8 then 3). The top of forms position is always at line 1. The forms length is determined by the setting of the Page Length Select switches on the right side of the Control Panel. The line space mode (6 or 8 LPI) is set by the 6/8 LPI switch on the right side of the Control Panel or by the Select Vertical Pitch Escape Sequence Control function. The line space mode will change when the command is received and when the current paper motion has been completed.

INTERFACE SELF TEST SWITCH

This switch is located in the upper right hand corner of the personality module (IPC1). When this switch is OFF (enabled), the printer will enter a Self Test mode when the Start switch on the Control Panel is pressed and exit the test when the Start switch is pressed again. The Self Test mode generates a line of print which is sent and received internal to the printer by the personality module (IPC1). This line is then processed as a test of data transmission, reception, printing and paper motion.

TRANSMITTERS, RECEIVERS AND I/O CONNECTOR

The transmitters, receivers and I/O connector used for this interface are shown in Figures 5-27 thru 5-29. Table 5-19 lists the signals and pin assignments for the I/O connector. The maximum cable length is 4000 feet (1219 meters) but cable length can degrade the maximum bit rate. See appropriate EIA standard.

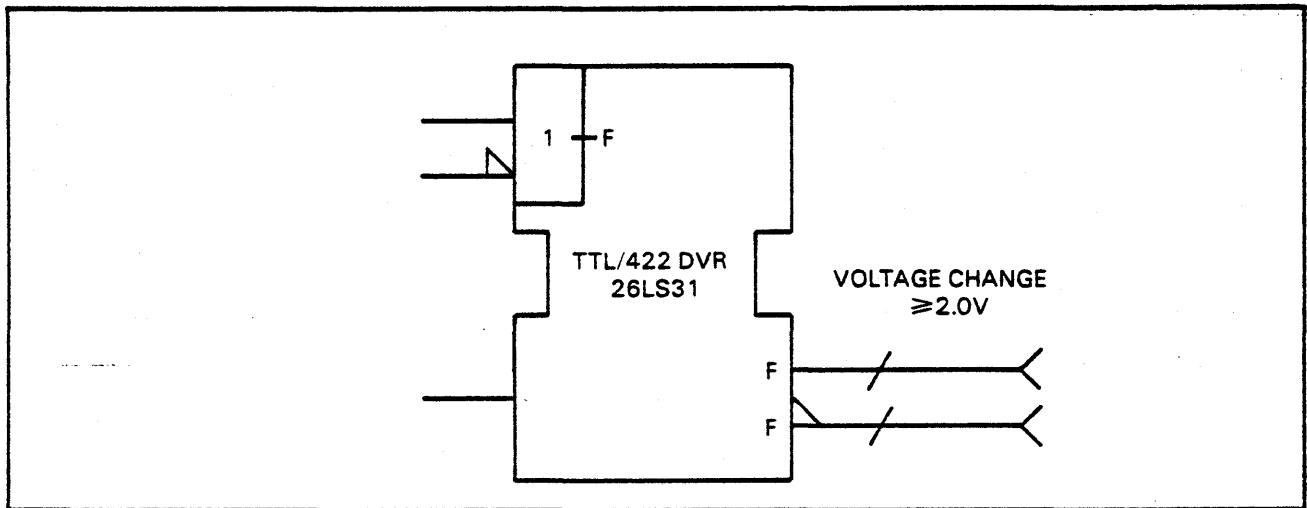


FIGURE 5-27. RS-422 TRANSMITTER

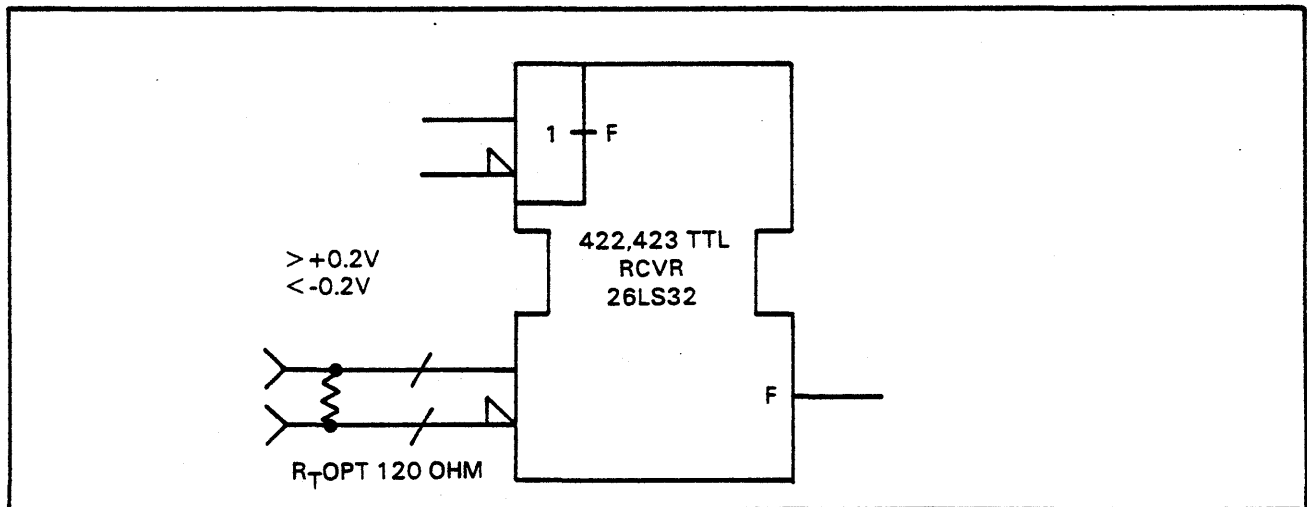


FIGURE 5-28. RS-422 AND RS-423 RECEIVER

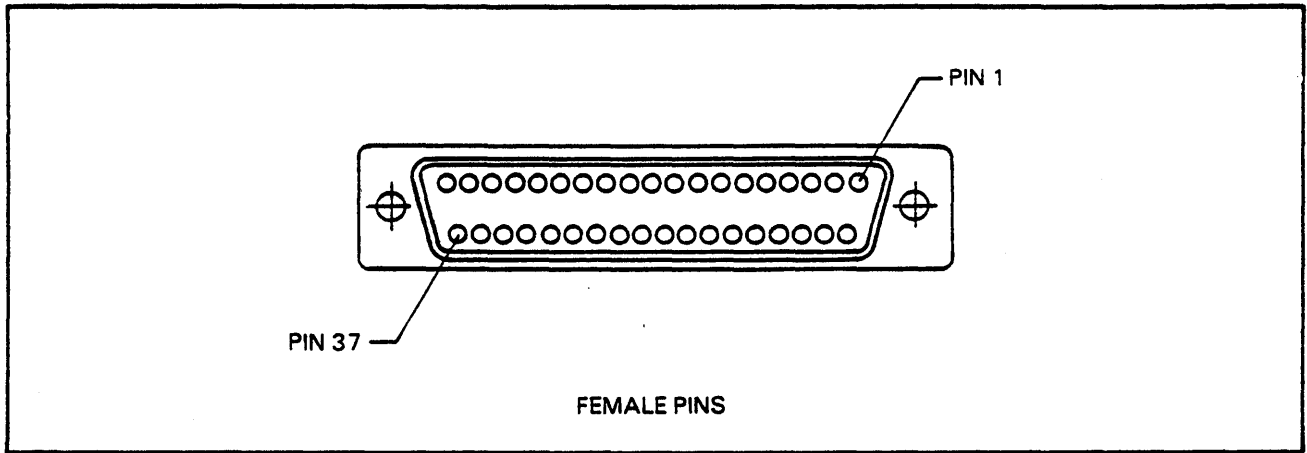


FIGURE 5-29. RS-449 37 PIN D TYPE CONNECTOR

TABLE 5-19. SERIES 1 CIRCUITS AND PIN NUMBERS

CIRCUIT DIRECTIONS	CONN. PINS		EIA RS-449
	A	B	
TO DCE	4	22	SD SEND DATA
FROM DCE	6	24	RD RECEIVED DATA
TO DCE	17	35	TT TERMINAL TIMING
FROM DCE	8	26	RT RECEIVE TIMING

SECTION VI CPU AND PRINT HEAD ELECTRONICS BOARDS

This section contains general information on the CPU board and the Print Head Electronics board. More detailed information will be documented in the following sections.

The CPU board is controlled by an 8085 microprocessor. It works in conjunction with the personality module to set up the printer's configurations and is the "go between" for the printer and the data source. It sends all commands to the Print Head board, which actually controls the action of the printer.

CPU BOARD FUNCTIONS (See Figure 6-1 and 6-2)

The CPU board contains the following major functions:

- a. Contains the main microprocessor and program memory.
- b. Contains the print buffer and EVFU RAM.
- c. Contains the band tracking microprocessor.
- d. Provides all clocks and timing.
- e. Generates HEP pulses.
- f. Provides fault sensing.

- g. Provides stepper motor controls.
- h. Controls the bus.
- i. Generates the compare pulses.
- j. Controls the status display.
- k. Controls the EVFU.

PRINT HEAD BOARD FUNCTIONS (See Figure 6-3)

The Print Head board contains the following major functions:

- a. Provides the drive for both the horizontal and vertical stepper motors.
- b. Provides control for the blower.
- c. Provides ribbon drive.
- d. Provides band drive.
- e. Controls the paper clamps.
- f. Controls the line counter.
- g. Contains the +5V regulator circuitry.
- h. Contains the power inhibits circuitry.
- i. Contains the character and home pulse sync and the phasing circuitry.

The Print Head board also contains an LED which indicates that +10V is present to the board. This +10V is an input to the +5V regulator.

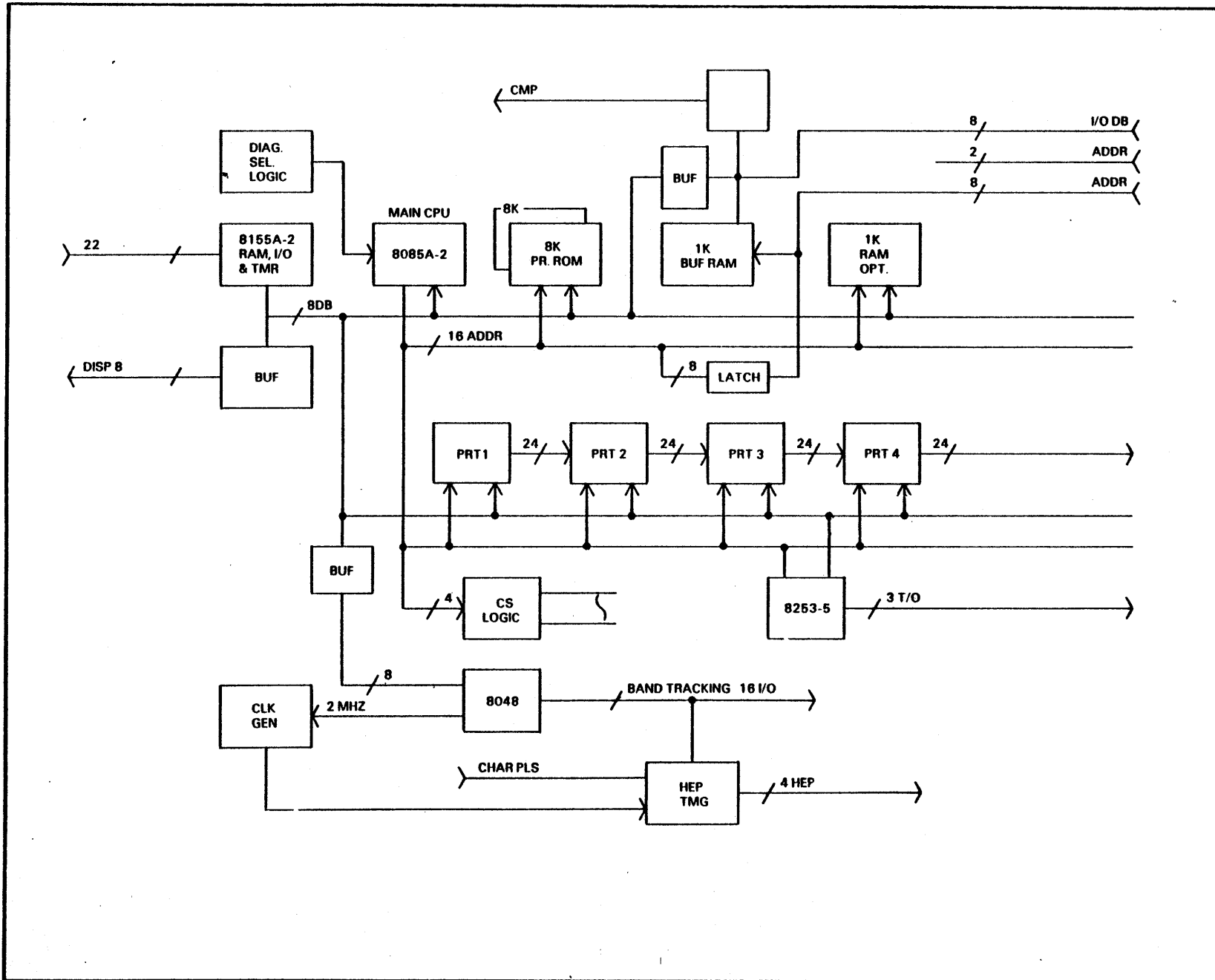


FIGURE 6-1. CPU BOARD (1PC2) BLOCK DIAGRAM

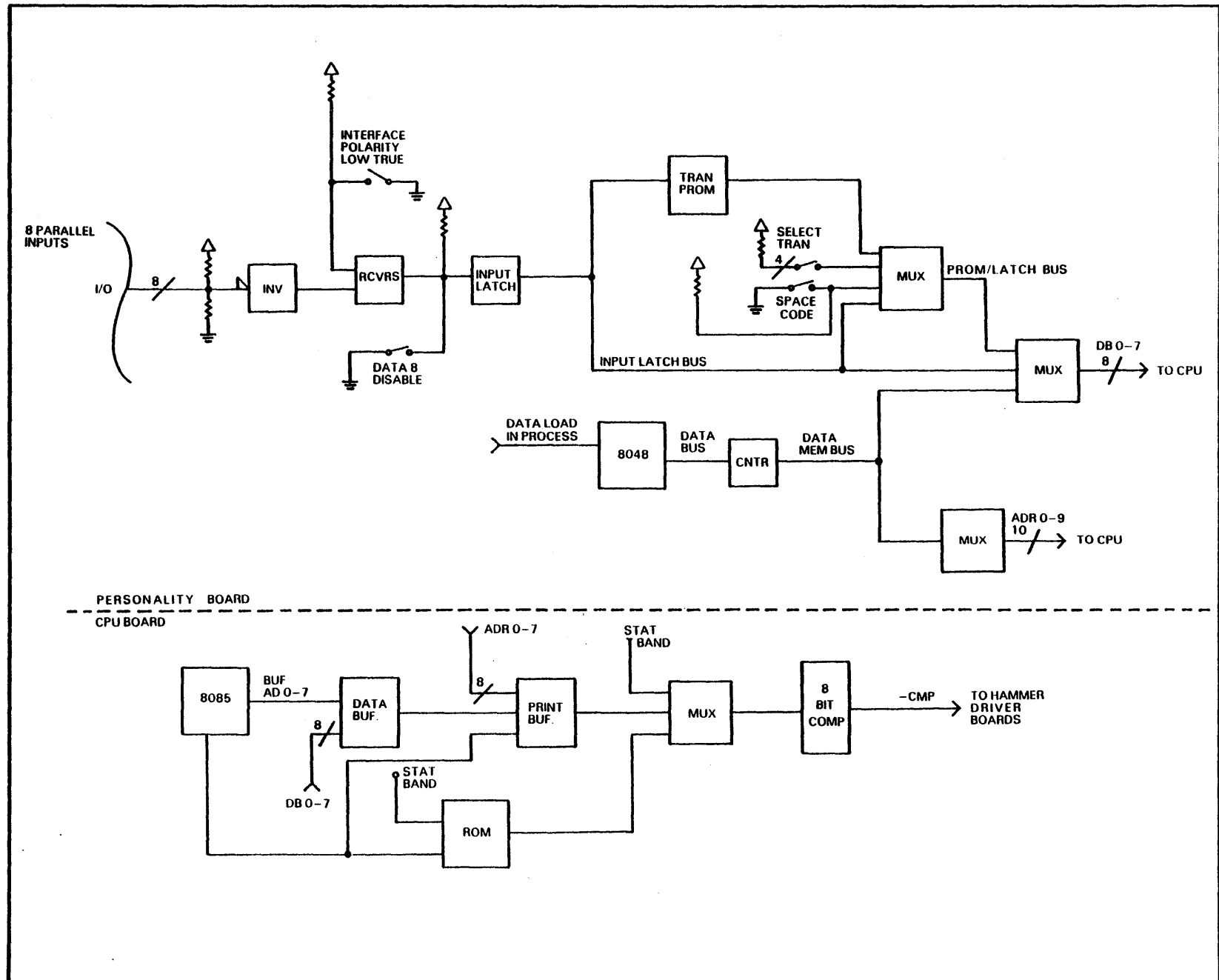


FIGURE 6-2. DATA BLOCK DIAGRAM

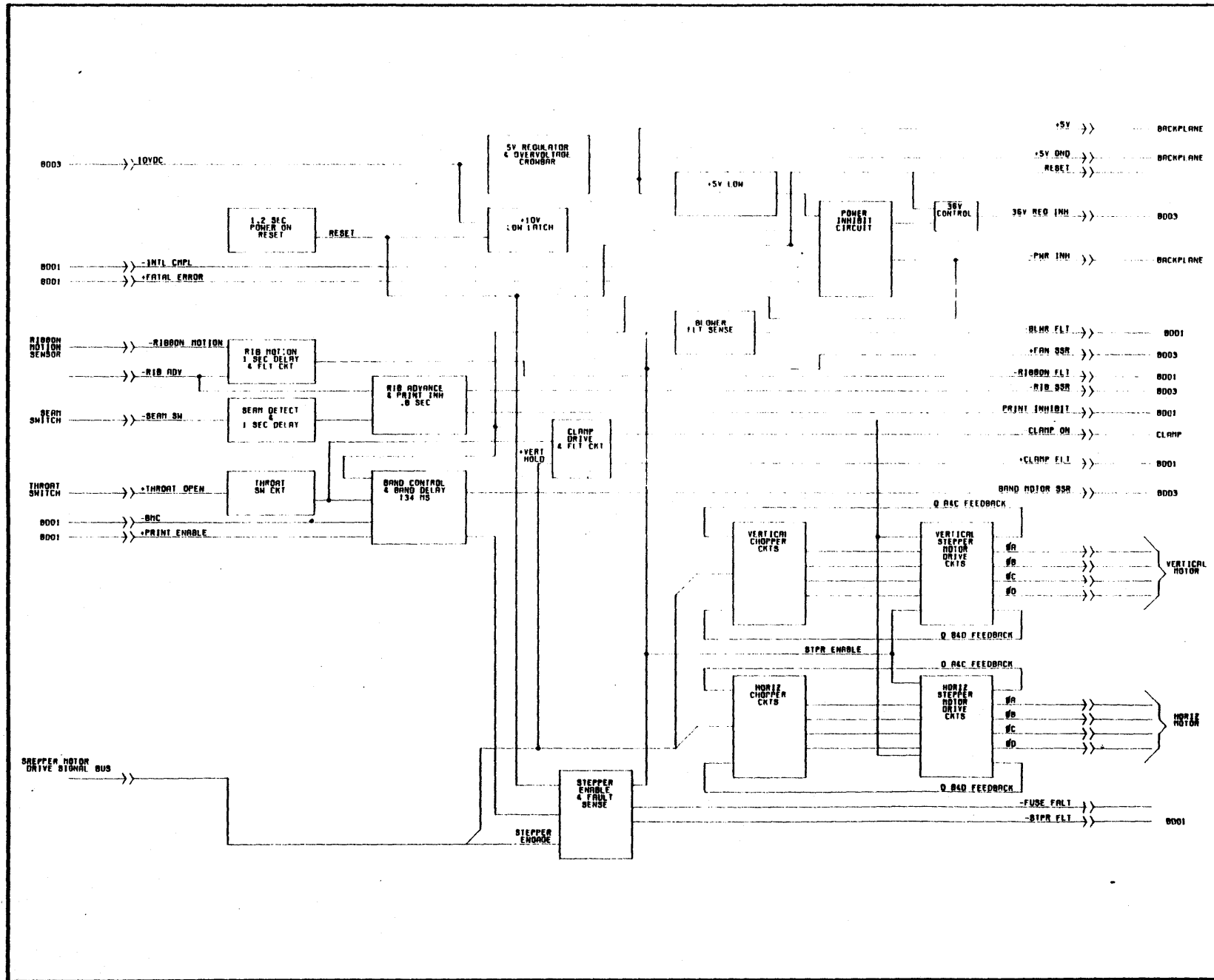


FIGURE 6-3. PRINT HEAD BOARD (1PC3) BLOCK DIAGRAM

CPU BOARD

The CPU board contains a scratch pad RAM (Port 5) and Bus Control (Port 3) in addition to Ports 1, 2, and 4, which are documented in Section 7.

Port 5 (I/O and Scratch Pad RAM)

Inputs to Port 5:

- a. Control Panel
- b. Band ID
- c. Horizontal Reader

Outputs from Port 5:

- a. Page Length Identification
- b. Configuration Data and Pulse Synchronization
- c. Timer Start
- d. Fault Indication

Port 3: (Bus Control Signal and Timers)

Inputs to Port 3:

- a. Timing Circuits
- b. Statistical Band ID
- c. EVFU Load Information
- d. Status Request

Outputs from Port 3:

- a. BSAVL (Bus Available)
- b. PRTEN (Print Enable)
- c. Paper Control

CPU LED's

There are three LED's installed on the board which provide the ability to observe the Horizontal Hold, Vertical Hold and Printing in Progress (PIP) functions.

LED 1: LED 1 is the right most LED as viewed from the component side of the board and is lit when Horizontal Hold is in progress.

LED 2: LED 2 is the middle LED and is lit when Vertical Hold is in progress.

LED 3: LED 3 is the left most LED as viewed from the component side of the board and is lit when printing is in progress.

Switches

There are switch networks installed on this board which allow the Customer Engineer the ability to program the printer to various configurations. See the Set-Up and Reference manual for locations of the switch networks on the CPU board.

Auto Line Feed Switch: The auto line feed DIP switch allows the selection of an automatic line feed upon recognition of a Carriage Return (CR) control code.

132/136 Column Select Switch: The 132/136 column select DIP switch determines the print line length. This switch must be set before the printer is powered ON since it is only sampled during the Power On initialization sequence. The selection of this switch is based on the hammer configuration of the printer. It would not be possible for the unit to print 136 columns if the printer is equipped with only 66 hammers (132 column printer). It is possible, however, to have the printer print 132 columns (only use 66 of the 68 hammers) if the printer is equipped with 68 hammers (136 column printer) by setting this switch.

Forms Control Select Switches: These two switches determine the paper motion format code and must be set before the printer is powered ON, since they are only sampled during the Power On initialization sequence. (These switches are not available for units equipped with Centronics I/O's) The selectable modes are as follows:

- a. **Forms Length Control Mode (FLC Mode).** These two thumbwheel switches on the right side of the Control Panel allow the operator to select the form length in whole inches and fractional inches.
- b. **I/O Loadable Vertical Format Unit Mode (IOVFU).** Vertical format information is loaded into the printer's RAM buffer over the interface lines. The appropriate BOF switch must also be turned ON.
- c. **Tape Loadable Vertical Format Unit Mode (TLVFU).** Vertical format information is loaded into the printer's RAM buffer by adding a tape reader which reads a punched format tape into the printer's RAM buffer. The appropriate BOF switch must also be turned ON.

Refer to the Maintenance Manual (Fault Isolation section) for switch set up on the CPU board. Refer to Section 3 (Vertical Motion Formatting) for additional information on switch functions.

Bottom of Forms Select Switches (BOF Switches): These two switches select the channel to be used as the Bottom of Forms (BOF) when operating in the optional IOVFU or TLVFU modes. (These switches are not available for units equipped with Centronics I/O's) They must be set before the printer is powered ON, since they are only sampled during the Power On initialization sequence. Channels 2, 8, 12 or no BOF, may be selected as the BOF channel by selecting different combinations of switches.

Slew to Top of Forms (TOF) Select Switches: This switch allows the paper to advance to or through the Top of Forms position. In one mode the paper will slew through the top of forms to the line count specified in the line counter command. In the alternate mode, the paper slew will stop at the top of form position rather than the specified line count.

Perforation Skip Length Select Switches: These two switches are only active when in the Forms Length Control (FLC) mode and when the APS switch on the Control Panel is turned ON. (This switch is not available for units equipped with Centronics I/O's) By configuring these switches to various positions, a 3, 4, 5, or 6 line skip between top and bottom of forms (and over the paper perforations) can be performed. In the optional IOVFU or TLVFU modes, the perforation skip length is determined by the top and bottom of forms channels. Refer to the Maintenance Manual (Fault Isolation section) for switch set up on the CPU board.

Vertical Tab (VT) Select Channel 3 or 4 Switch: This switch is only active in the optional IOVFU or TLVFU modes and allows a vertical tab (VT) command to select either channel 3 or channel 4 of the EVFU data. If the EVFU data is not loaded, the VT command will generate a channel select (CHSL) error and the printer will perform a single space paper motion. Refer to Table 3-1 for EVFU load format and Table 3-2 for paper motion commands and control codes.

Print Bottom of Form (BOF) Line: This switch is available for units equipped with Centronics I/O's. When active, printing can occur on the BOF line.

Test Print Mode Select Switch: This switch can be set to a special mode which allows special tests for diagnostic routines or a standard mode which allows various test print patterns. The special diagnostic routines are intended for C.E. usage only. This switch should always be left in the standard mode for operator usage. Refer to the Maintenance Manual (Fault Isolation section) for switch set up.

See C.E. Diagnostic Routines following for a description of the routines available.

ASCII Character Select Switches: These eight switches allow selection of ASCII characters. When switch "9" is OFF the other eight switches can be configured in any combination to allow selection of ASCII character code set-up.

Character Pattern Select Switches: These eight switches allow selection of special diagnostic routines when in the special mode (switch "9" is ON) or allow selection of a test print character when in the standard mode (switch "9" is OFF).

Line Counter on Power Up: This switch is only sampled during the Power On sequence. When active, this switch allows the use of Line Counter commands for paper motion. This happens immediately upon Power Up and regardless of the Forms Length Control mode selected (FLC, IOVFU, or TLVFU). When this switch is not active, the Line Counter commands are only active when two conditions are met:

- a. When IOVFU or TLVFU has been selected.
- b. When the EVFU has been loaded or the Line Counter Only flag has been set.

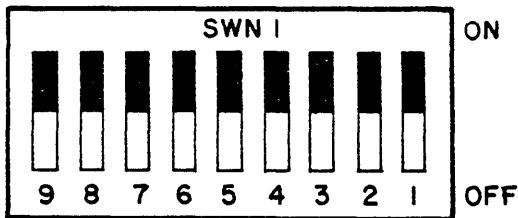
When the printer is put back into service, these switches should never be left in a position which selects a code whose position on the print band has no character. This could result in band or hammer damage if printing occurs at this character position. Refer to the Maintenance Manual (Fault Isolation section) for switch set up, for the diagnostic routines available and the ASCII character switch positions.

C.E. Diagnostic Routines

When the Test Print Mode Select switch is in the special mode position and when the Configuration Test switch on the Control Panel has not been selected, certain diagnostic routines are available to the Customer Engineer. These tests are selected by activating the appropriate DIP switch on the CPU board. After selecting the desired diagnostic routine, the function may be activated by pressing the Test Print switch on the Control Panel and exited by pressing the switch again. Most fault sensing is suppressed during these routines in order to allow fault diagnosing or set up to occur. The following diagnostic routines are available:

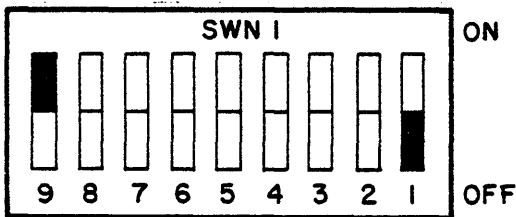
- Sliding Alphabet
- Horizontal Motion (Shuttle)-LW400 Only
- Horizontal Set Up-LW400 Only
- Vertical Motion (Exercise Vertical)
- Load EVFU
- Display Test
- Run Ribbon and Band (Ribbon/Band Motion)
- Examine Print/EVFU/Status Memory

Sliding Alphabet:



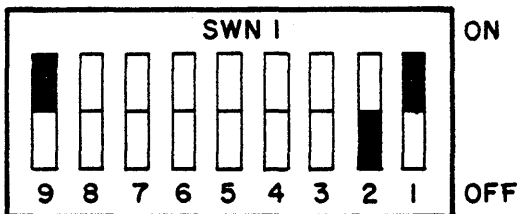
By setting the DIP switches on the CPU board as shown above, a sliding alphabet pattern is printed once the Test Print switch on the Control Panel is pressed. The sliding alphabet pattern will shift on character through the entire code set available on the installed print band.

Horizontal Motion (Shuttle) LW400 Only:



By setting the DIP switches on the CPU board as shown above, the printer exercises the horizontal system only once the Test Print switch on the Control Panel has been pressed. This is a horizontal shifting routine which shifts the hammer bar left to right and right to left.

Horizontal Set Up LW400 Only:

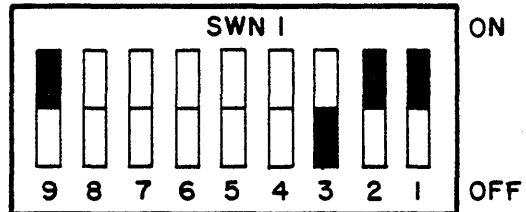


By setting the DIP switches on the CPU board as shown above, a horizontal set up routine is activated and may be used as an aid in the adjustment of the horizontal shift system once the Test Print switch on the Control Panel is pressed.

The first depression of the Test Print switch places the horizontal four phase stepper motor on phase A of its sequence. The next depression of the Test Print switch places the stepper motor in each of the possible full step positions (phases A, B, C, D, A', B', and C'), and some of the half step positions (phases AB and DA'). The actual phase or phases are displayed on the Control Panel's display. The phase po-

sition (A, B, C, etc.) is alternately displayed with the horizontal position transducer level (HOME or NHOM). The position C' represents the right most position of the hammer bar which is used in the compressed pitch mode. The next depression of the Test Print switch will cause the routine to be exited. Refer to the Hammer Bar Home Position Adjustment Procedure in Section 4 of the Maintenance Manual for further information.

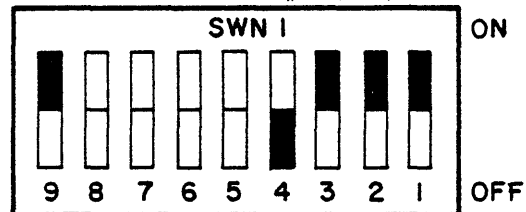
Vertical Motion (Exercise Vertical):



By setting the DIP switches on the CPU board as shown above, the printer will exercise the printer's vertical paper motion system in one of two modes once the Test Print switch on the Control Panel has been pressed.

- If the EVFU is not loaded, successive single line feeds will be performed.
- If the EVFU is loaded, a vertical slew to each channel loaded will occur with a printout of that channel selected at that line.

Load EVFU:

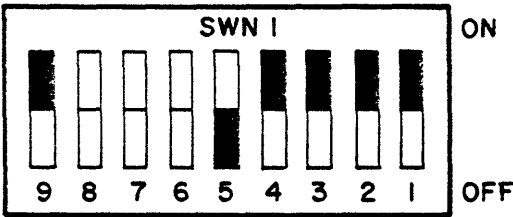


By setting the DIP switches on the CPU board as shown above, the printer will load a "canned" program into the EVFU memory once the Test Print switch on the Control Panel has been pressed. This routine loads all channels into EVFU memory on half inch paper intervals. Starting with channel 1, each channel is loaded into memory and the selected BOF (bottom of forms) channel is positioned appropriately.

If the EVFU mode is not selected (by DIP switches) before executing this diagnostic, a NOLD (No Load) status will be displayed on the Control Panel for two seconds. See section II of the Maintenance Manual.

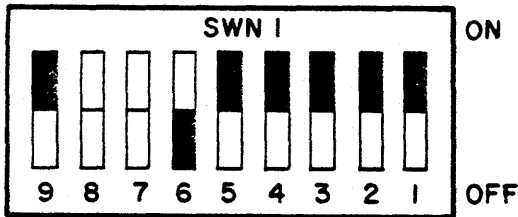
An On Line operation immediately after executing this diagnostic should not be attempted since the EVFU data may not be appropriate. The printer should be powered OFF prior to an On Line operation after using this diagnostic to erase the "canned" EVFU program.

Display Test:



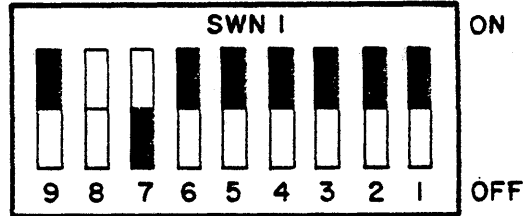
By setting the DIP switches on the CPU as shown above, the printer will enter a test routine which exercises the Control Panel's diagnostic display once the Test Print switch has been pressed. Once the switch is pressed, all sixteen segments of the alphanumeric display will light. Pressing the switch again will display "TPSW" until the switch is released, at which point the normal status of the printer will be displayed.

Run Ribbon and Band (Ribbon/Band Motion):



By setting the DIP switches on the CPU board as shown above, the printer will enter a routine which activates only band and ribbon motion once the Test Print switch on the Control Panel is pressed. Since faults are ignored by the printer, this routine may be used for fault diagnosing or adjustments.

Examine Print/EVFU/Status Memory:



By setting the DIP switches on the CPU board as shown above, the printer enters a routine which allows either the print buffer memory, the EVFU data memory or machine status bytes to be examined and displayed on the Control Panel's diagnostic display once the Test Print switch on the Control Panel is pressed.

The diagnostic display will alternately display "EVFU", "BUFR", and "STAT". Depression of either the Form Feed switch or the Single Cycle switch while the selected memory segment (EVFU, BUFR or STAT) is displayed will cause the printer to enter the read memory mode of the selected segment. In this mode the left two digits of display will provide the address of the memory location or a designator of the type of status being read. The right two digits of the display will provide the hexadecimal representation of the data in memory.

When the print buffer (BUFR) is the selected segment, the address range is 00(hex) to FF(hex). When the EVFU memory (EVFU) is selected, the address range is from 00(hex) to 16A(hex). Since the left two digits cannot display this range of addresses, the period of each digit will be lit when the EVFU address increments above FF(hex). The period will be displayed up to the maximum address of 62A(hex) which allows addressing up to 363 bytes of EVFU memory.

When the status read (STAT) is selected, the two left digits of the display will provide a designator indicating the type of data being read. See Tables 6-1 and 6-2. Status Bytes 2 to 7 (S2 to S7), Flag bytes 1 to 6 (F1 to F6), Control Code (CC) and Last Control Code (LC) are the designators used. The address, or designator, may be incremented by pressing the Single Cycle switch or decremented by pressing the Form Feed Switch. Holding either switch down for more than .5 seconds will cause the routine to enter the auto increment/decrement mode, which will stop as soon as the switch is released.

TABLE 6-1. STATUS BYTES

STATUS NUMBER	BIT	FUNCTION
STBYT2 ("S2" on printer display)	0(LSB)	HERR
	1	FUS2 (Clamp)
	2	IOER
	3	HMR
	4	PWR
	5	BLWR
	6	STPR
7(MSB)	NHOM	
STBYT3 ("S3" on printer display)	0(LSB)	OOP
	1	FRMS
	2	RIB
	3	GATE
	4	
	5	BMSE
	6	BSE
7(MSB)	BAND	
STBYT4 ("S4" on printer display)	0(LSB)	OOP
	1	FRMS
	2	RIB
	3	GATE
	4	
	5	BMSE
	6	BSE
7(MSB)	BAND	
STBYT5 ("S5" on printer display)	0(LSB)	TAPE
	1	NTOF
	2	DVFU
	3	OVFL
	4	CHAN
	5	CHSL
	6	ILCH
7(MSB)	ILCD	
STBYT6 ("S6" on printer display)	0(LSB)	PAGE
	1	INIT
	2	DROM
	3	
	4	FUS3 (STPR)
	5	FUS4 36V-LW400
	6	FUS5 36V-LW800
7(MSB)	NOLD	
STBYT7 ("S7" on printer display)	0(LSB)	INTEGER SEL 0
	1	INTEGER SEL 1
	2	INTEGER SEL 2
	3	INTEGER SEL 3
	4	FRACTION SEL 0
	5	FRACTION SEL 1
	6	FRACTION SEL 2
7(MSB)	VERTICAL FORMAT ERROR	

5204

A display of 5204 would indicate an *I/O error* (bit 2 of Status Byte 2 has been set hi). The bits are hexadecimal representations. ie. 04 is encoded as:

BITS 7 6 5 4 3 2 1 0
HEX CODE 0 0 0 0 0 1 0 0 (= 4 hex)

5205

A display of 5205 would indicate an *I/O error* and *hammer error* (bit 2 and bit 0 of Status Byte 2 have been set hi). The bits are hexadecimal representations. ie. 05 is encoded as:

BITS 7 6 5 4 3 2 1 0
HEX CODE 0 0 0 0 0 1 0 1 (= 5 hex)

NOTE

The letter "S" on the Status Display appears the same as the number "5".

TABLE 6-2. FLAG BYTES

FLAG NUMBER	BIT	FUNCTION	FLAG NUMBER	BIT	FUNCTION
FGBYT1 ("F1" on printer display)	0(LSB)	I/O has selected pitch	FGBYT4 ("F4" on printer display)	0(LSB)	Acceleration complete
	1	6/8 pitch flag		1	Slew complete
	2	EVFU loaded		2	Stop flag
	3	Horiz motion settle		3	BOF loaded
	4	Load complete		4	Off line paper motion
	5	Test print switch released		5	Paper settle complete
	6	Test print stop		6	Start deceleration
	7(MSB)	Horiz pitch (Std 0)		7(MSB)	Deceleration complete
FGBYT2 ("F2" on printer display)	0(LSB)	Gate open	FGBYT5 ("F5" on printer display)	0(LSB)	EVFU line counter only
	1	Tape load in progress		1	Inhibit
	2	Forward		2	EVFU perf skip
	3	Verify Flag		3	Forms length counter less than 80
	4	Tape load complete		4	Half space error
	5	TMR 1 complete		5	Hammer settle flag
	6	Reader check		6	Single cycle
7(MSB)	Test print	7(MSB)	Odd/even half space		
FGBYT3 ("F3" on printer display)	0(LSB)	Forms length control	FGBYT6 ("F6" on printer display)	0(LSB)	Initialization complete
	1	IOVFU		1	
	2	TLVFU		2	
	3	Forms length control		3	
	4	Bottom of forms (BOF)		4	
	5	Horiz motion in progress		5	
	6	Vert motion in progress		6	
7(MSB)	EVFU data loaded	7(MSB)			

SECTION VII VERTICAL AND HORIZONTAL SYSTEMS

This section contains detailed information on the electronics required for vertical and horizontal movement. It also contains the control and drive circuits plus the drive mechanisms themselves.

CONTROL SIGNALS (from CPU Board)

Software of Port 2

Vertical Inputs to Port 2:

- a. Forms Control Select (switches)
- b. Perforation Skip Select (switches)
- c. Out of Paper (OOP)

Vertical Outputs from Port 2:

- a. Phases A through D
- b. Vertical Hold
- c. Vertical 2 phase motor
- d. PIP (Printing in Progress)

Horizontal Inputs to Port 2:

- a. Bus information

Horizontal Outputs from Port 2:

- a. Phases A through D
- b. Horizontal Hold
- c. Horizontal 2 phase motor.

Port 1

Inputs to Port 1:

- a. 360 or 720 LPM Configuration
- b. PMV CLR (Paper Motion Verification Clear)
- c. Auto Line Feed (switch)
- d. Slew To or Slew Through Top of Form (switch)
- e. 132 or 136 column select (switch)

Outputs from Port 1:

- a. Bus information

Port 4

Inputs to Port 4:

- a. Bottom of Form select (switches)
- b. Page Length select (switches)
- c. Vertical Format Unit Channel

Outputs from Port 4:

- a. Vertical Format Unit motor control
- b. Test Print Pattern select information

STEPPER MOTORS

The vertical and horizontal stepper motors used in this printer are identical. They move in 1.8 degree increments. It takes 200 steps for the motors to achieve a complete revolution (360 degrees).

For vertical motion to occur, it requires 32 steps of the motor for the paper to advance 1/6 inch (6 lines per inch), and 24 steps of the motor for the paper to advance 1/8 inch (8 lines per inch). See the Timing Diagrams in the logic schematics for timing relationships.

DRIVE SIGNALS (From the Print Head Electronics board)

The combination of two phases Horizontal Hold and Vertical Hold plus Band On allows the Stepper Enable signal to occur. The Horizontal or Vertical two phase signals and the Hold signals are routed through a Hybrid SMCC (Stepper Motor Constant Current) to one-shots (50 us for Horizontal, 50 us for Vertical) then they are "anded" with a motor phase and Stepper Enable. The output of this circuitry is applied to drive transistors for the vertical and horizontal drive motors. The drive transistors then feed back to the Hybrid SMCC.

Phases A and C or B and D of the Vertical or Horizontal Phase signals are always "anded" to give one of the signals required for the Stepper Enable signal. This can be monitored at TP10 on the Print Head Electronics board.

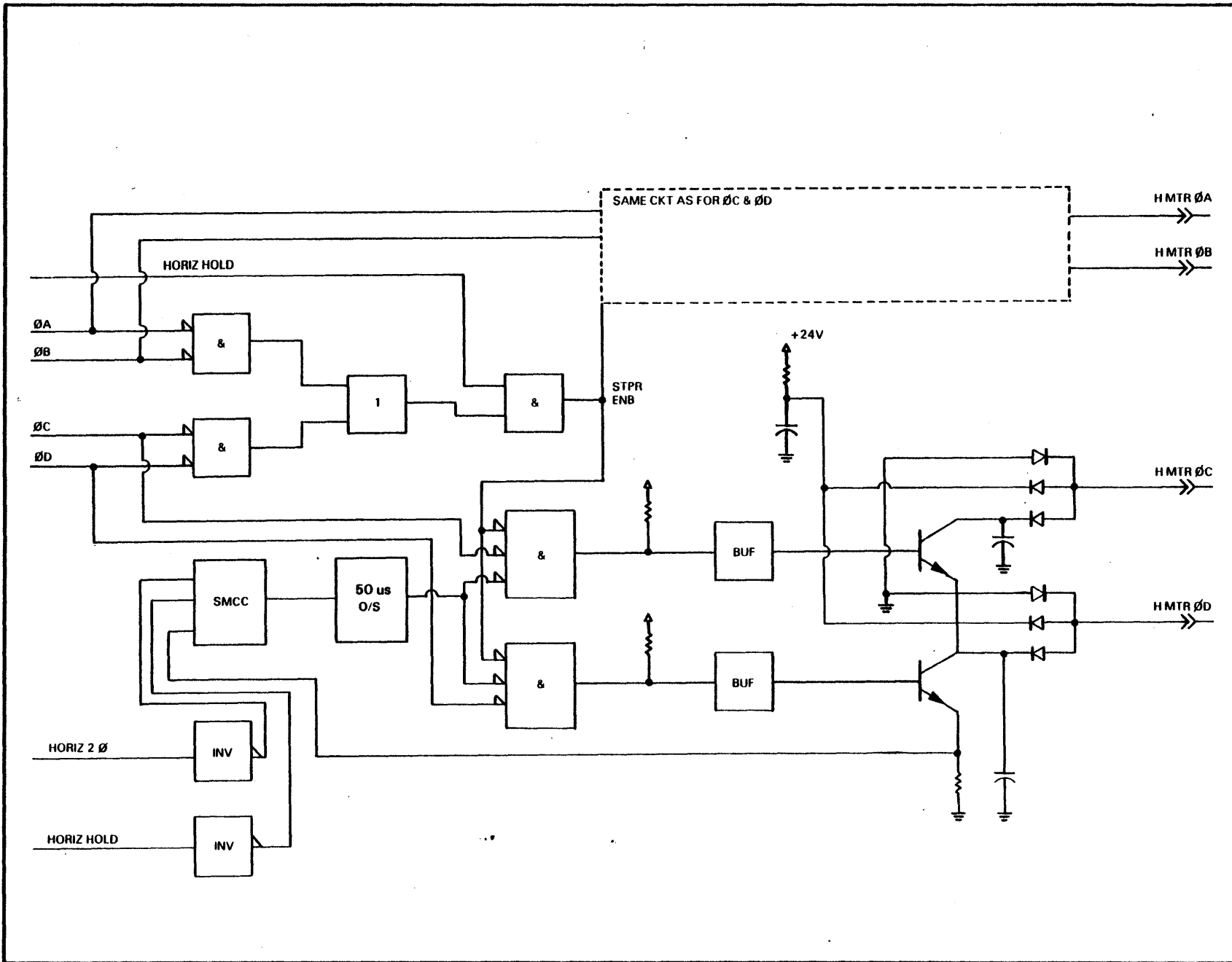


FIGURE 7-2. HORIZONTAL POSITION CONTROL

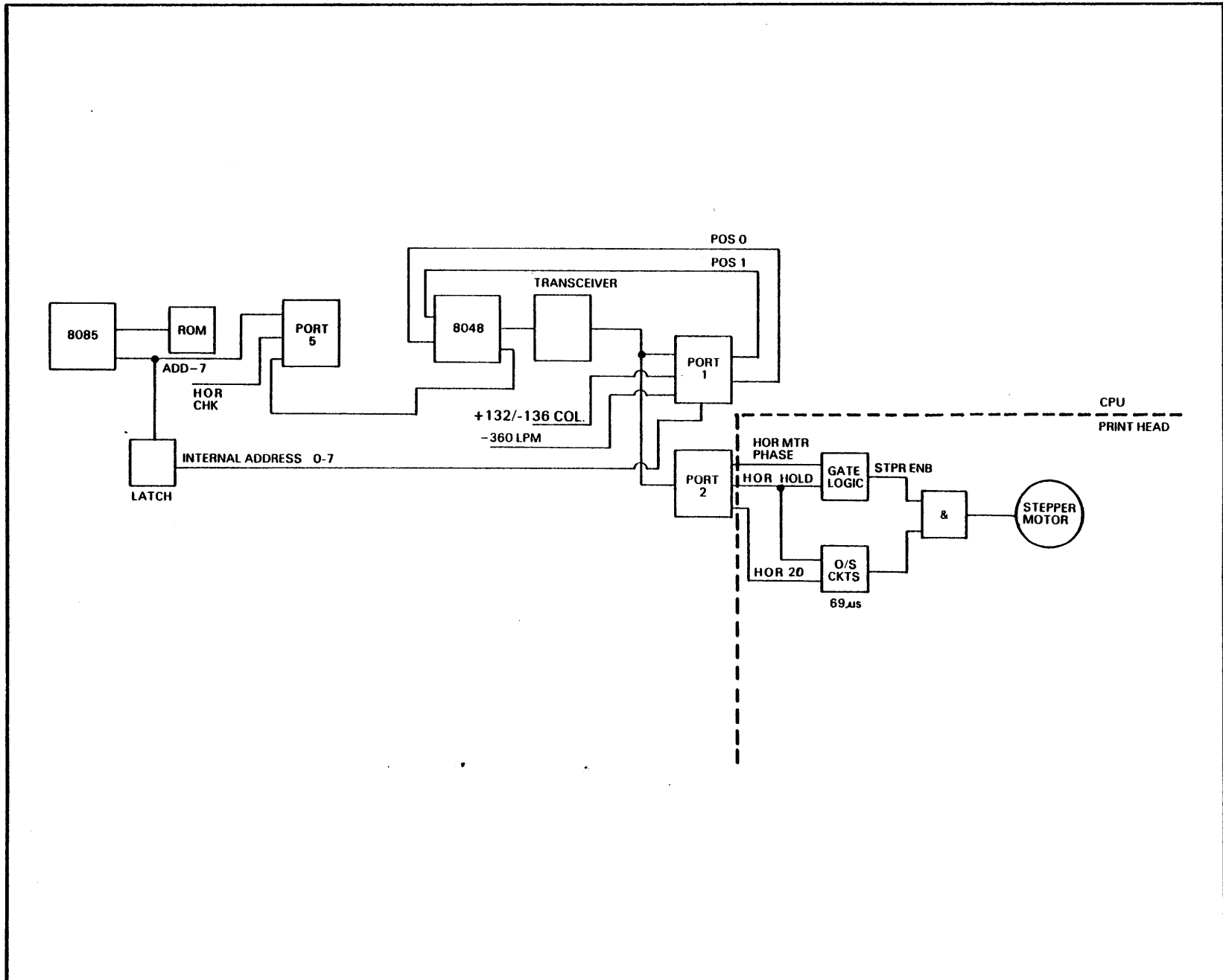


FIGURE 7-3. HORIZONTAL BLOCK DIAGRAM

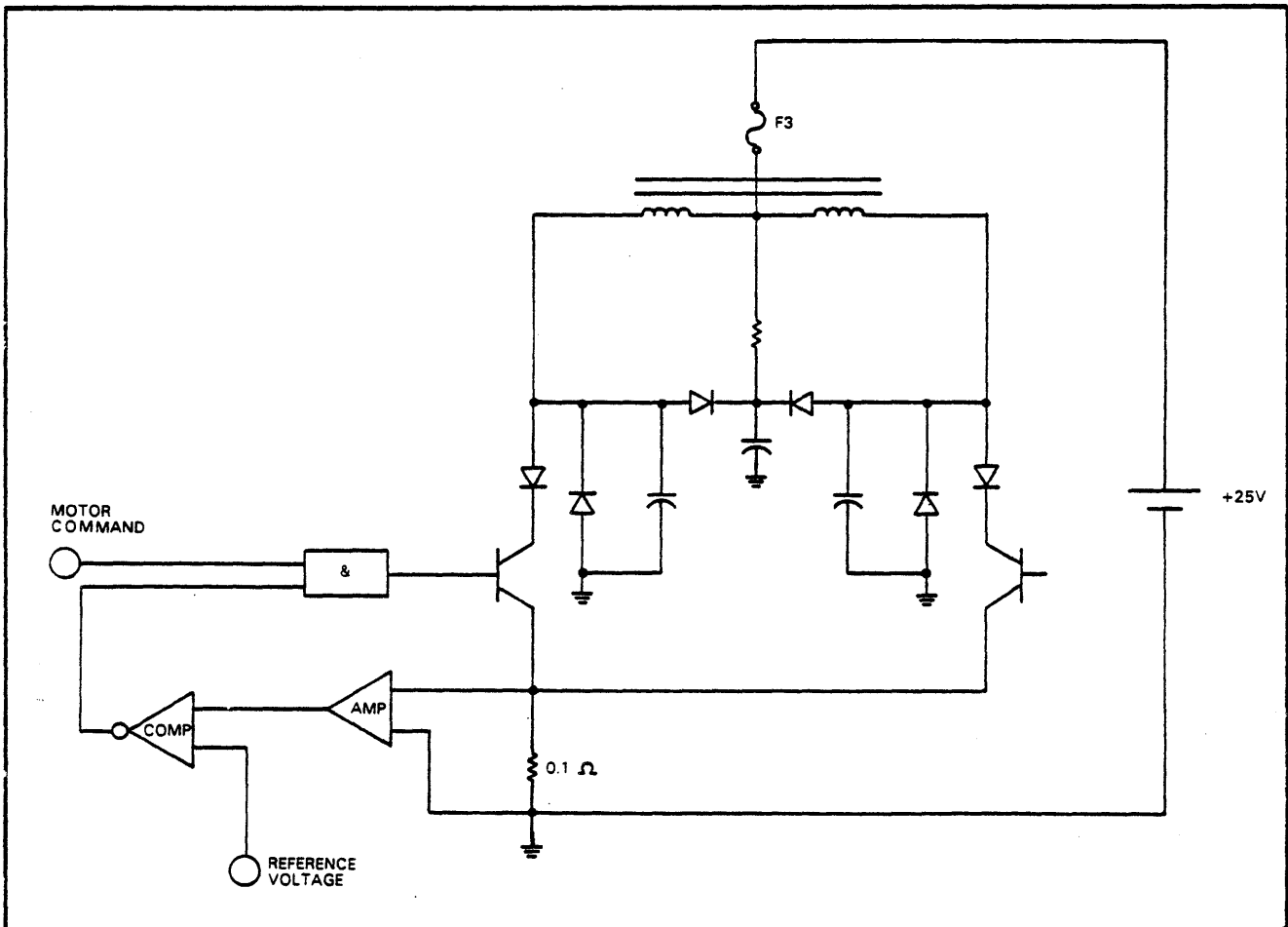


FIGURE 7-4 STEP MOTOR DRIVE ELECTRONICS

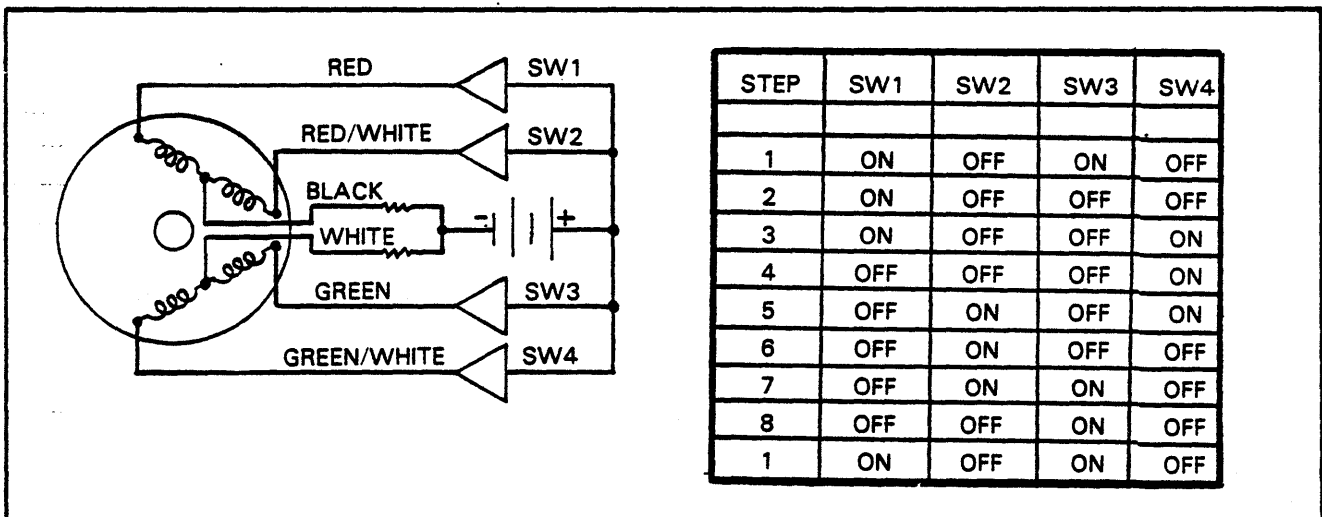


FIGURE 7-5. STEPPER MOTOR 8 STEP SEQUENCE

SECTION VIII BAND AND RIBBON SYSTEMS

This section contains information on the band (band timing signals, band tracking) system and the ribbon system.

The print band is the key to all the timing in the printer. The band speed must be sensed by the printer in order to properly sequence hammer firing. The printer must also sense the number of characters in the font on the band so that the proper number of ASCII codes can be generated. The number of home marks or statistical font identification marks on the band must be identified in order to set up either standard or compressed pitch and the proper print speed. The printer uses this control derived from the band for the print sequence to control ribbon motion.

PRINT BAND CONTROL

The print band is designed to be operator changeable which allows maximum character set flexibility. The band is driven by an AC synchronous motor at a rate of 120 inches per second. The positions of the characters on the band is monitored through a band sensor assembly and raised lines on the band. The raised lines below the characters are character pulses. There is one line beneath every character on the band. The raised line(s) above the characters are home pulses and identifies the band two ways:

1. The line or lines above the characters identifies the beginning of each font or set of characters on the band. The character sequence of each font is identical (unless a statistical band is installed).
2. The line or lines above the characters identifies the band as a standard band, compressed pitch band or statistical band. Standard bands have one line above the beginning of each font, compressed pitch bands have two marks, statistical bands have three or more marks.

Character pulses control band speed, home pulses control band detected. Band control is achieved by employing an 8748/8048 microprocessor chip on the

CPU board. An 8255A-5 programmable interface (on the CPU board) uses signals from the 8748/8048 and the 8085A-2 (both on the CPU board) to provide BMC (band motor control), RIB ADV (ribbon advance), and an input to statistical sequencing. See the timing diagrams and logic schematics.

Outputs from 8748/8048:

- a. BMSE
- b. BSE
- c. Band 2⁰
- d. Band 2¹
- e. Band Detected
- f. Bus line from 8085A-2

Inputs to 8748/8048:

- a. Pre Character Pulses
- b. Print Enable
- c. Home Sync Pulse
- d. Pos 1
- e. Pos 0
- f. BMC (feedback)

RIBBON CONTROL

The ribbon cassette and its rollers are operator changeable. Ribbon motion is achieved by an AC unidirectional motor which is started by a signal from the 8255A-5 chip, Port 1 as a result of the Print Enable signal. Ribbon motion stops 900 msec (approximately 1 second) after printing is complete. Ribbon motion and presence of ribbon is detected by a sensor which consists of a rotor and hall effect switch, housed in the pressure roller assembly.

The useful ink life of the ribbon is 400,000 lines when printing a typical field pattern (400,000 lines is equivalent to 18X10⁶ characters).

Ribbon jams are minimized by the use of a resonator on the right side of the cassette which allows the ribbon to "float" off of the bottom of the cassette thereby yielding smooth ribbon delivery.

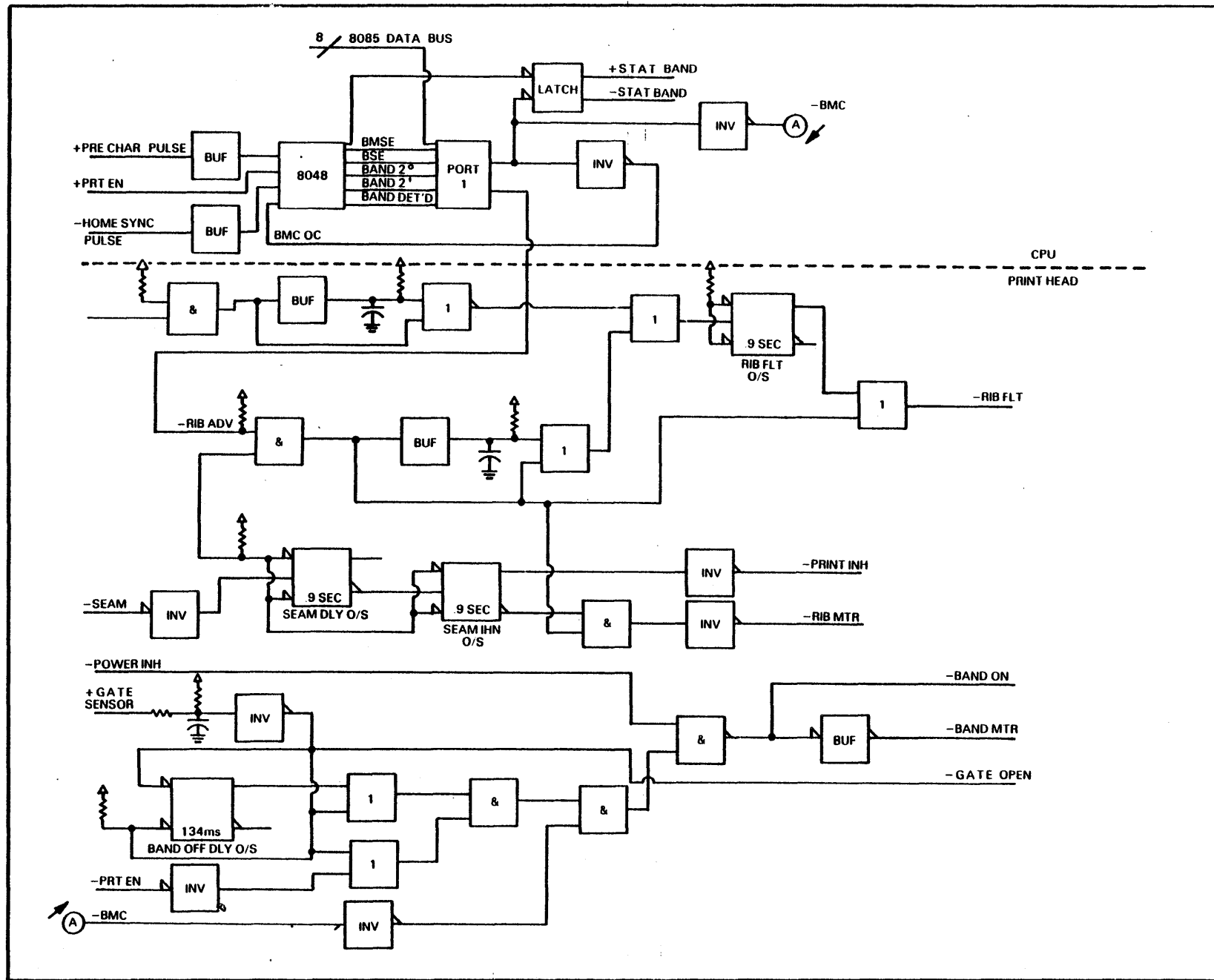


FIGURE 8-1. BAND AND RIBBON CONTROL

8-3/8-4

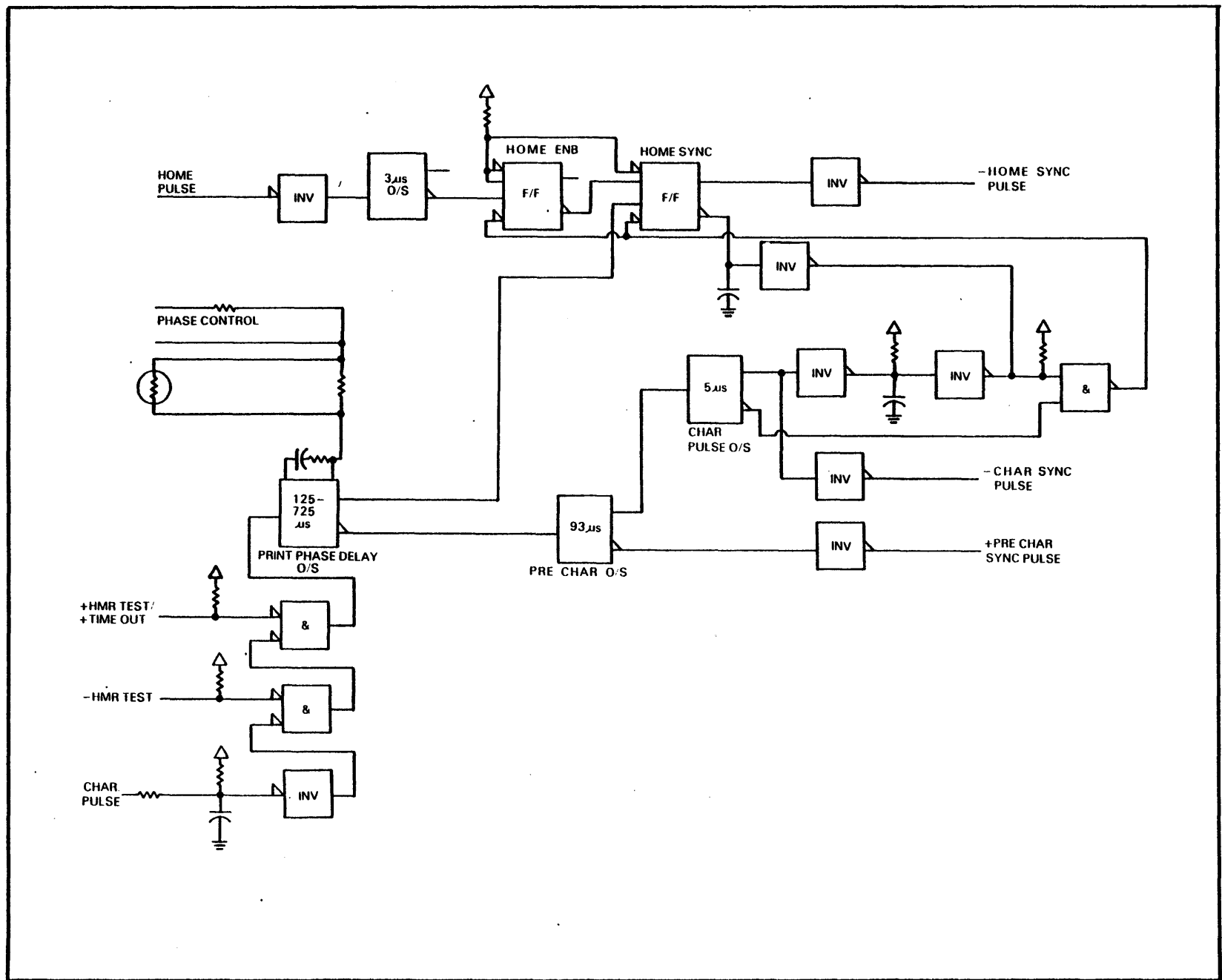


FIGURE 8-2 PHASE ADJUST AND HOME SCAN

SECTION IX

HAMMER DRIVER BOARD AND HAMMER MODULE ASSEMBLIES

This section contains detailed information on the hammer bank components and Hammer Driver Board functions and signals required to fire hammers.

PRINT HAMMER SYSTEM

This printer uses a time-shared linear hammer technology to print a line of data by shifting the hammer bar left and right with a stepper motor. This shifting of the hammer bar allows each hammer to print more than one column. Each hammer prints two columns in standard pitch mode, and three columns in compressed pitch mode. The stepper motor shifts the hammer bar in .100 inch increments when operating in the standard pitch mode, and .066 inch increments when operating in the compressed pitch mode. See Figure 9-1.

The print hammers are mounted in removable modules on the hammer bar with four hammers per module for 136 column (68 hammers) machines. For 132 column (66 hammers) machines there are four hammers per module except for the end module, which only has two hammers. See Figure 9-2.

Behind each print hammer there is an actuator assembly. Each actuator assembly is composed of an armature and coil. The coil is controlled by a hammer driver circuit located on the hammer driver board. When the coil is energized by the drive circuit, it attracts the armature, propelling the pushrod forward against a spring loaded hammer. The hammer is then driven forward against the paper, ribbon and print band to print the character. Upon impact, the hammer rebounds to its original starting position. Its oscillations are dampened by the hammer return spring. The hammer is brought to a complete rest by the spring before the next firing time of the hammer. See Figure 9-3 and 9-4.

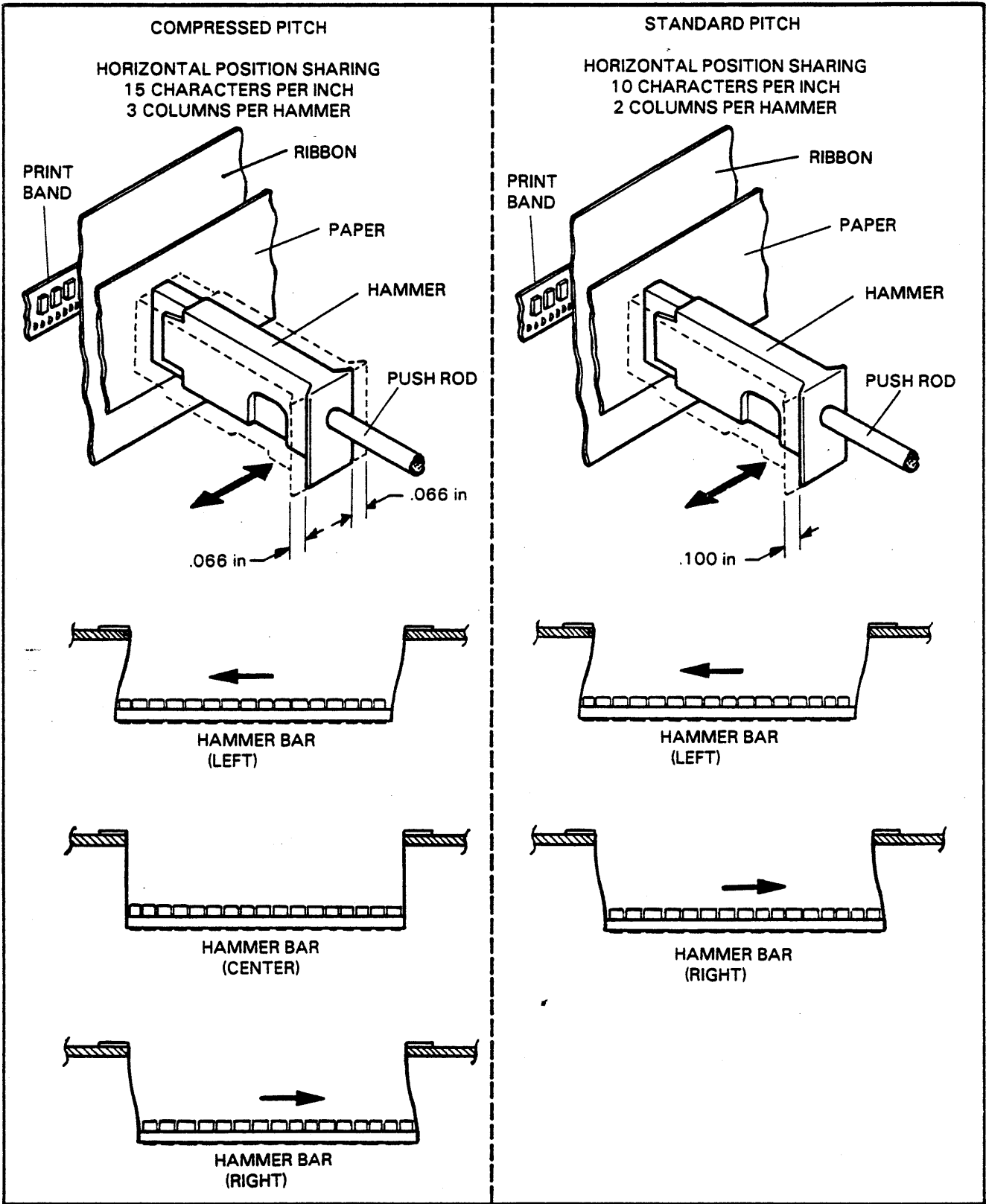


FIGURE 9-1. HORIZONTAL HAMMER POSITION SHARING

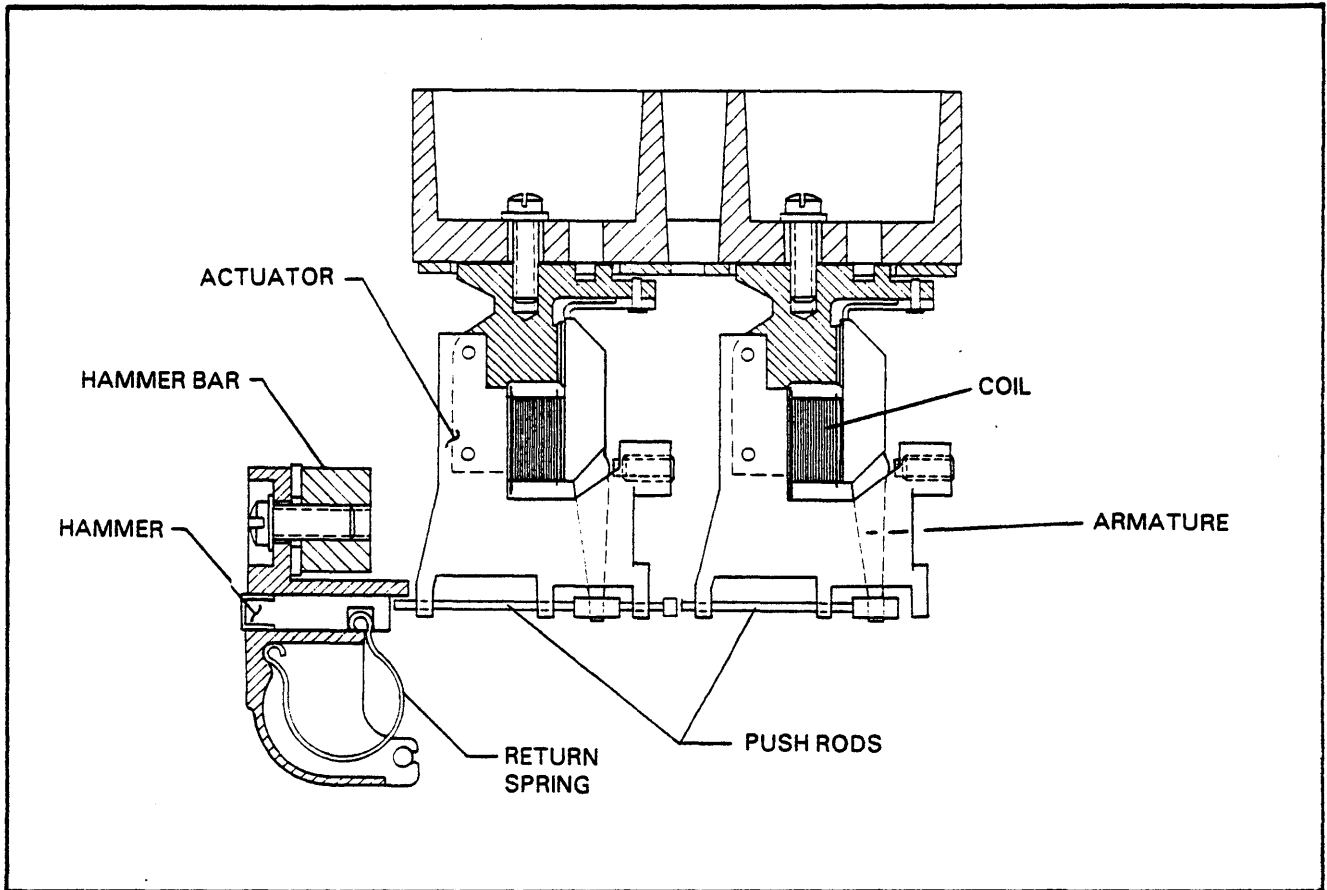


FIGURE 9-2. HAMMER BANK COMPONENTS

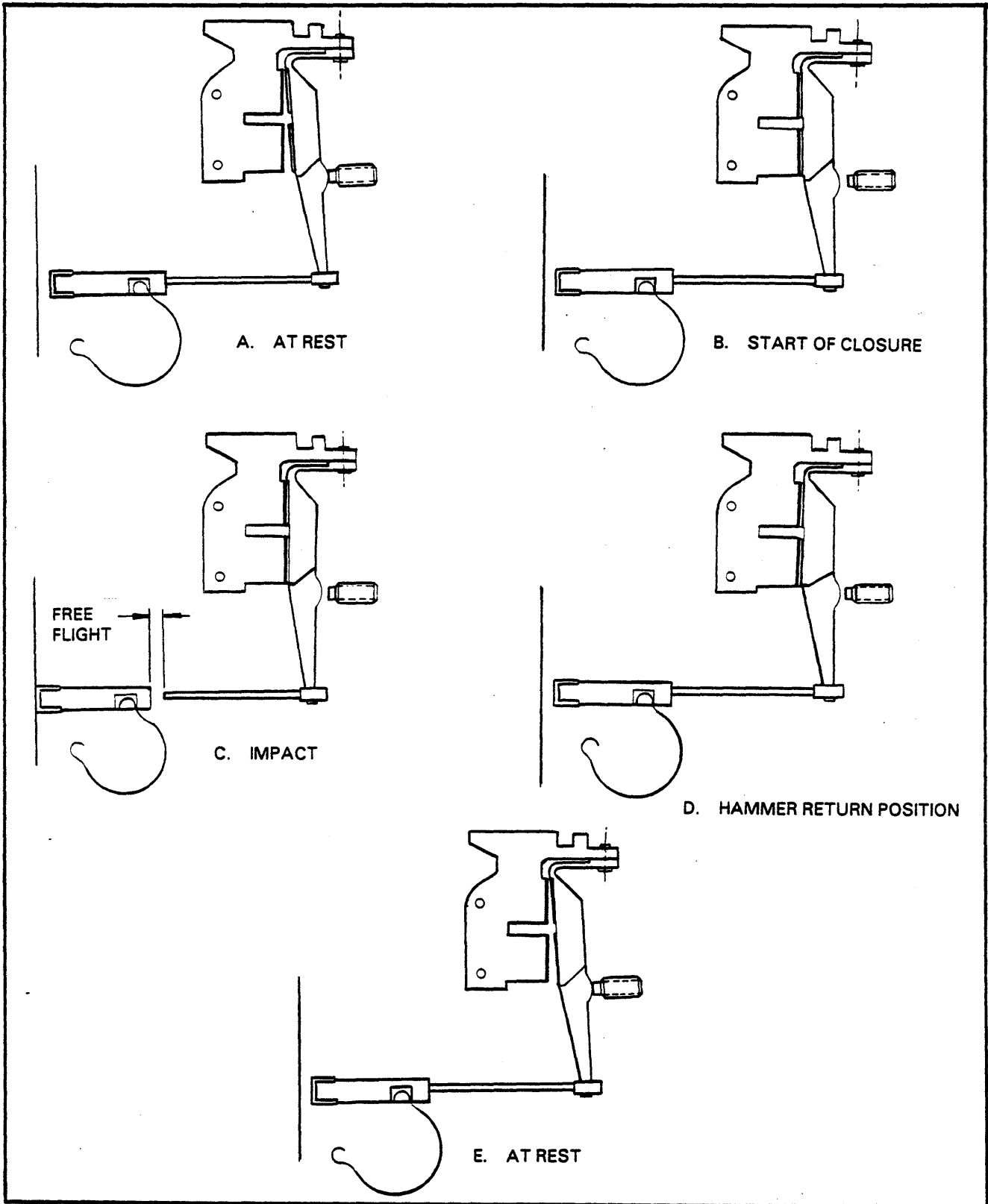


FIGURE 9-3. HAMMER PRINTING CYCLE

PRINT HAMMER SCHEMATIC

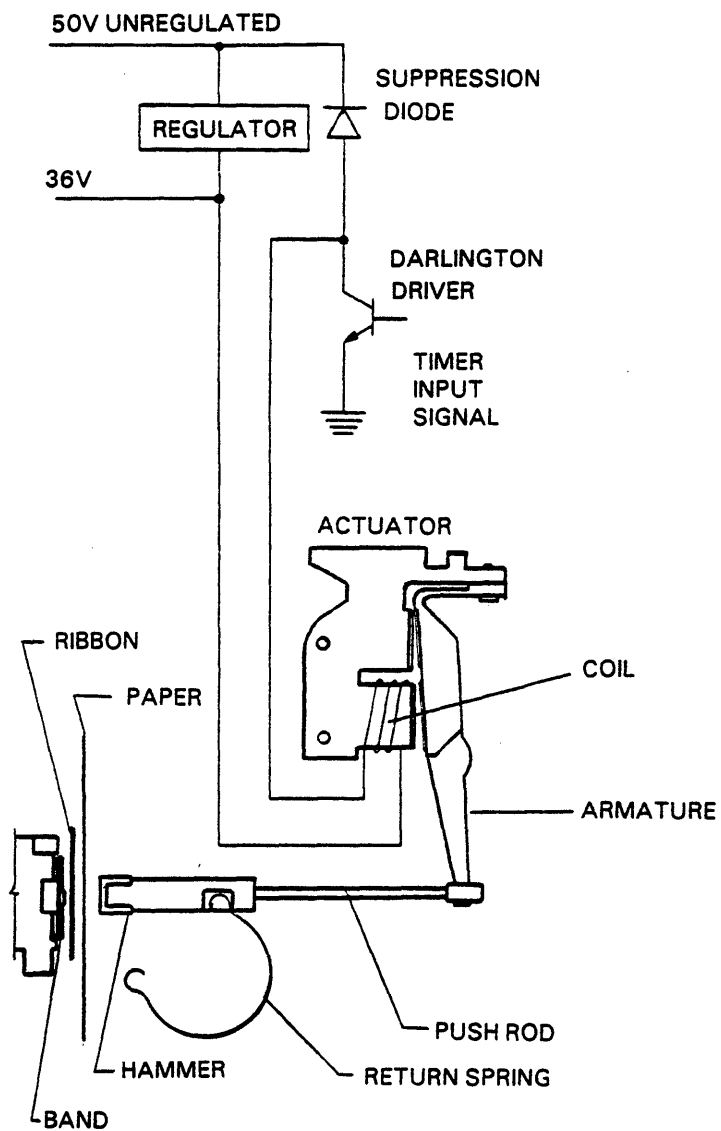


FIGURE 9-4. PRINT HAMMER SCHEMATIC

HAMMER DRIVER BOARD

The hammer driver circuits control the operation of the actuator assemblies which drive the print hammers forward. There are 68 driver circuits contained on this board. With a column capacity of 136 columns (two horizontal positions of 68 hammers), each driver circuit operates an actuator. When a smaller column capacity is used (132 columns with 66 hammers), two load resistors are installed on the hammer driver board connectors for the last columns not used. Two resistors are necessary because each hammer prints two columns.

The hammer driver board also provides the +36V regulator circuitry. This circuitry converts the +50V input power to the board to a regulated +36V with over/under voltage protection. The under vol-

tage limit is +33V, the upper voltage limit is +39V. If voltage variances occur beyond these limits, the printer will crobar (lose its +36V supply). If the printer does crobar, the +36V can be restored by powering the printer OFF then ON.

There is a paper motion verification (PMV) circuit on this board which senses the movement of paper. The sensor is located on the inner throat plate and serves two functions: Paper motion sensing and out of paper (OOP) sensing. This PMV sense circuitry sends an output pulse from a hall effect sensor generated by a rotating wheel moved by the motion of the paper. Paper must move within 2.6 MSEC. If paper does not move within this time period, a fault condition (FRMS) will occur. This circuitry is only active when the printer moves, or tries to move paper.

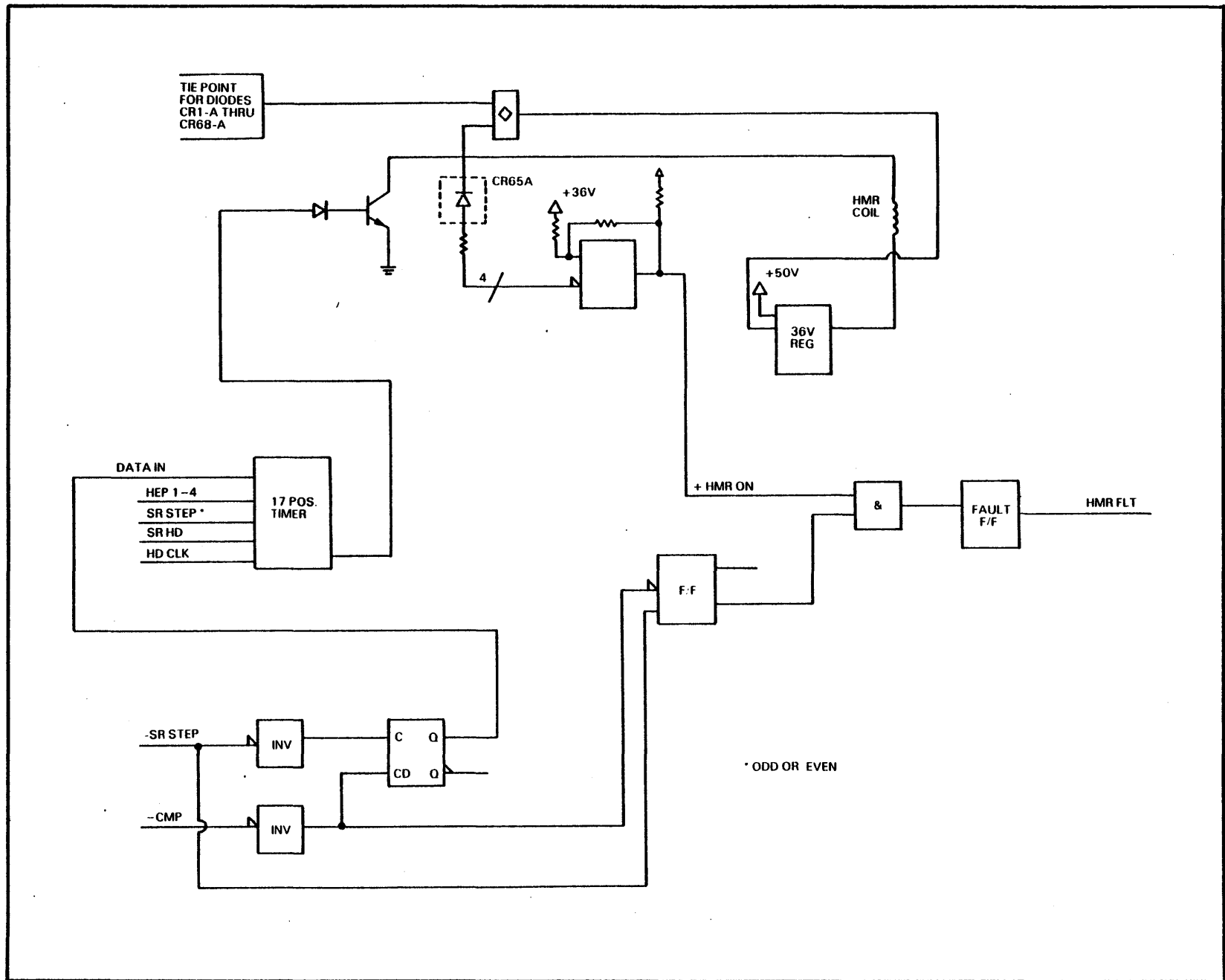


FIGURE 9-5. HAMMER DRIVER BLOCK DIAGRAM

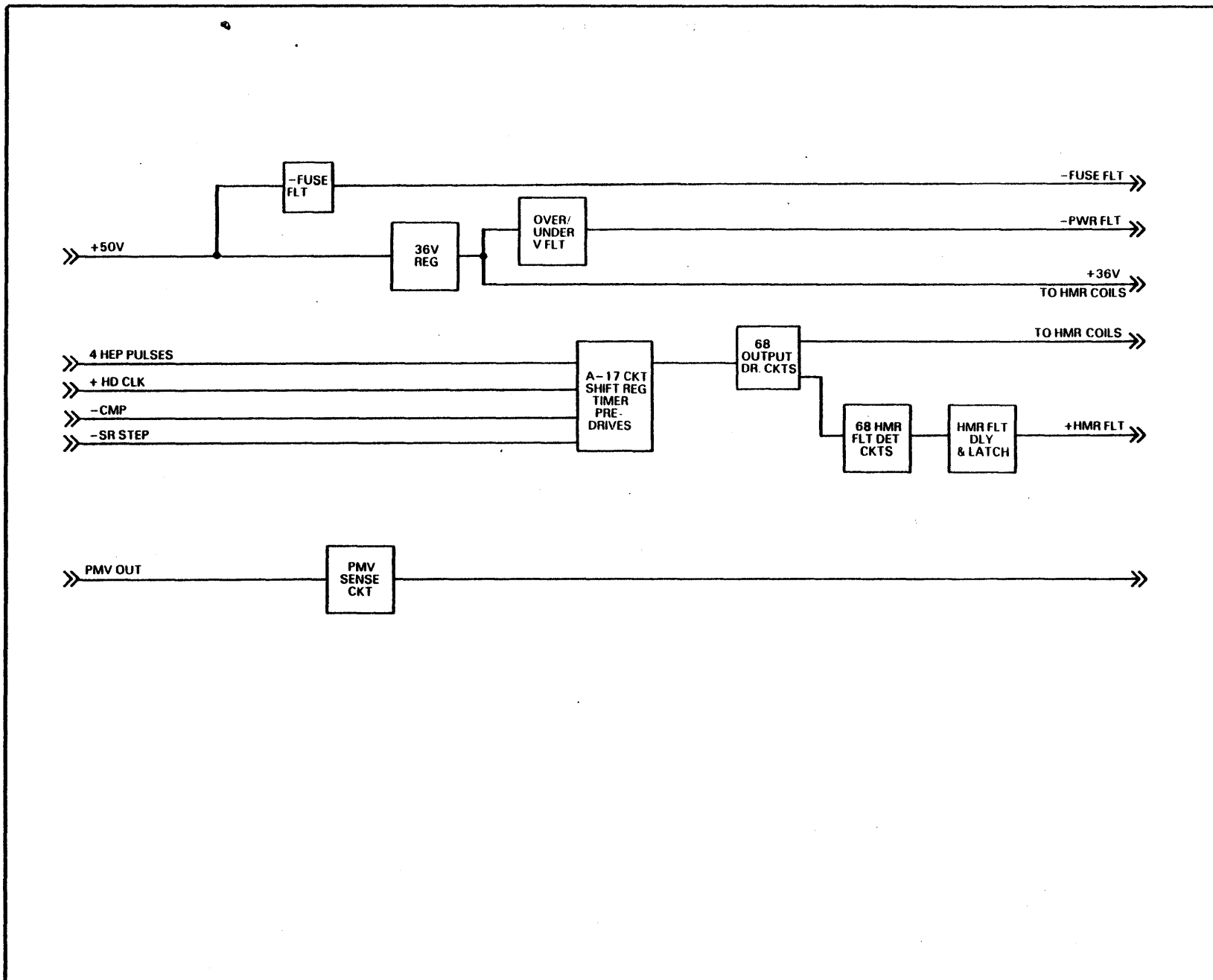


FIGURE 9-6. HAMMER DRIVER BLOCK DIAGRAM

HAMMER FIRING

A print cycle can be started once the printer has loaded a line of data, recognized a character pulse, and a compare timing sequence has been completed.

A compare timing sequence is completed between every character pulse on the band. Its function is to load the hammer driver shift register with compares between the memory data code and the character generator (or Image ROM if using a statistical band). See Figure 9-9.

During a compare timing sequence, every other memory location depending on the current position of the hammer bar (either odd columns or even columns) is compared to a code generated by a character generator. A character generator simulates band character codes for every character on the band. This sequence is repeated for every font (or sets of characters) on the band. At the beginning of every simulated font, the character generator is reset to a predetermined count: 20 hex for 48, 64, and 96 character bands, and 0 hex for 128 character bands. A total of 68 compares are attempted for each compare timing sequence.

During the first compare timing sequence no printing is done because the shift register is being loaded with printable data. Compares are printed after the second and before the third character pulse. Printing of compares is always delayed by one character pulse. During the printing sequence another compare timing sequence is taking place so that printing can occur between the next two character pulses.

The HEP STB (Hammer Enable Pulse Strobe) signal is a basic subscan clock signal which is coincident with the Subscan 1 thru Subscan 4 (SS1 thru SS4) pulses. The time between two band character pulses is referred to as a scan time called the HEP STB signal. The HEP STB signal is divided into fourths and generates the SS1 thru SS4 signals, making this a four subscan system. These subscans represent relative time intervals at which hammers can be fired.

This printer uses two horizontal printing positions in standard pitch; a home position of the hammer bar and a shifted position of the hammer bar. In each of these two positions there are hammers positioned at every column. When the hammer bar is in the home position, the odd columns on the forms have hammers and those columns can be printed. When the hammer bar is in the shifted position, the even columns on the forms have hammers and those columns can be printed. However, due to the spacing between characters on the band, only every other hammer (or every fourth column on the forms) will be lined up with a band character during any one subscan. During either horizontal position this printer will print during two (of the four) subscans. Since the hammer and character alignment for both subscans takes place at the same time, the hammers for both subscans are fired at the same time. In the home position, SS1 and SS3 are fired together. In the shifted position, SS2 and SS4 are fired together. In both positions, every hammer is fired for every character compare.

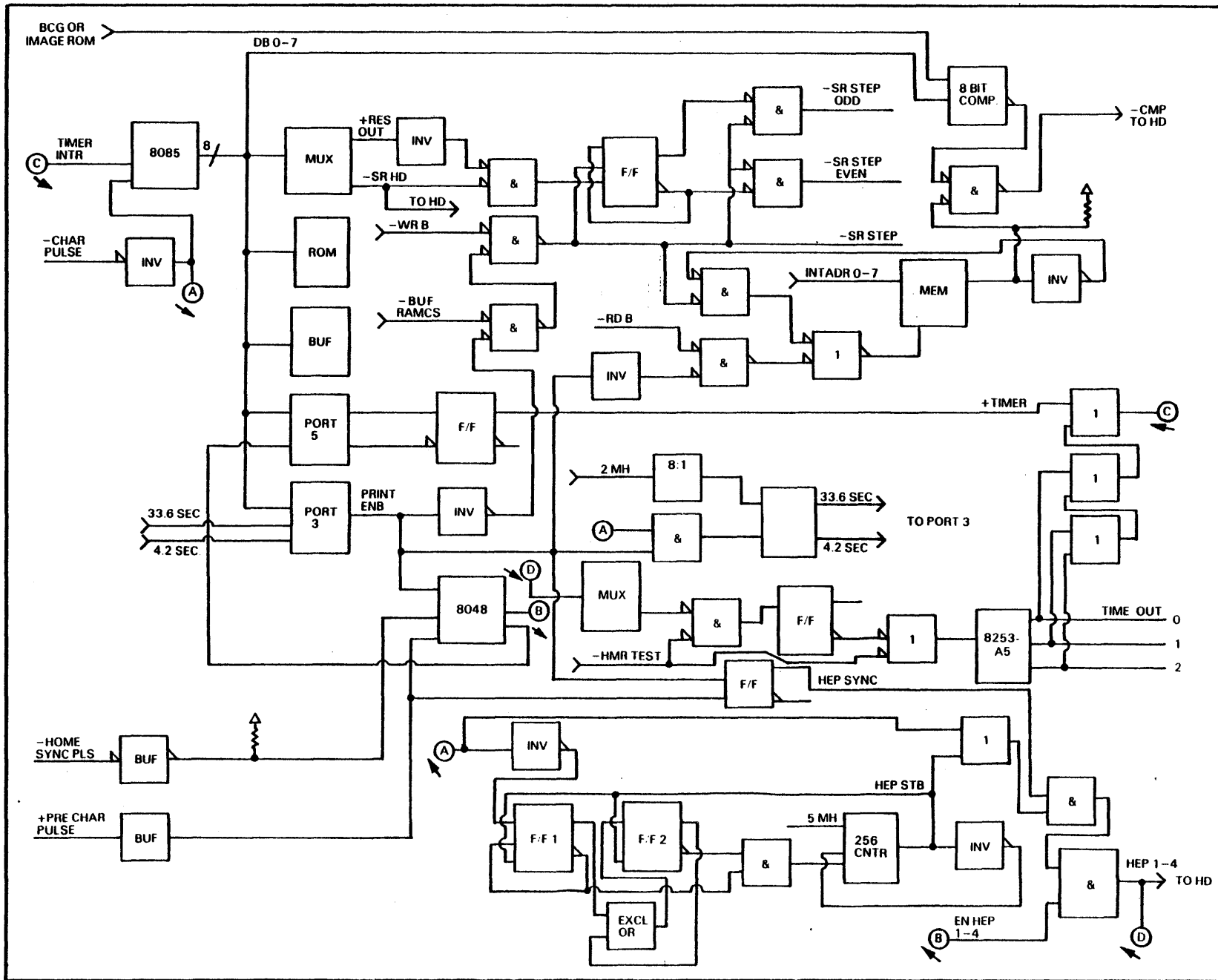
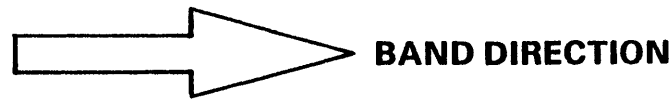
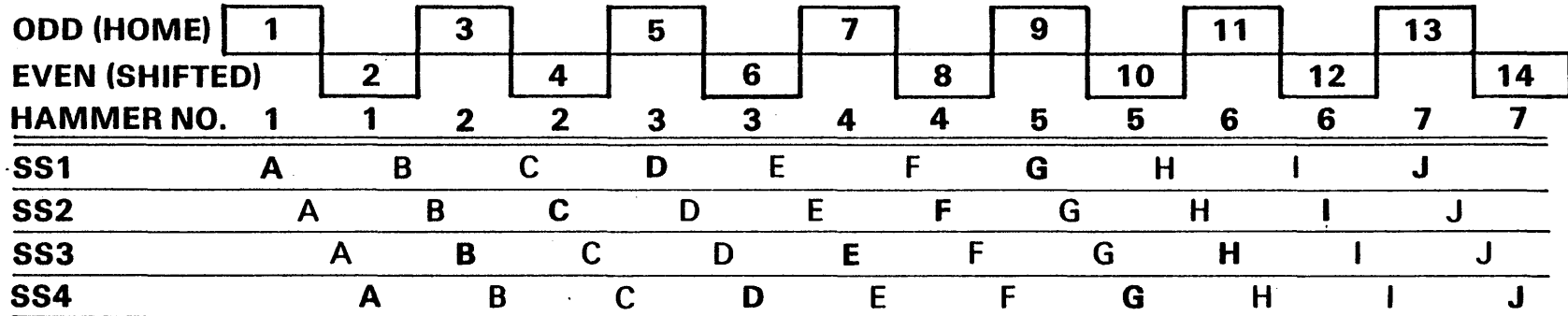


FIGURE 9-7. HEP AND COMPARE BLOCK DIAGRAM

STANDARD PITCH

COLUMNS  .100 in.



COMPRESSED PITCH

COLUMNS  .066 in.

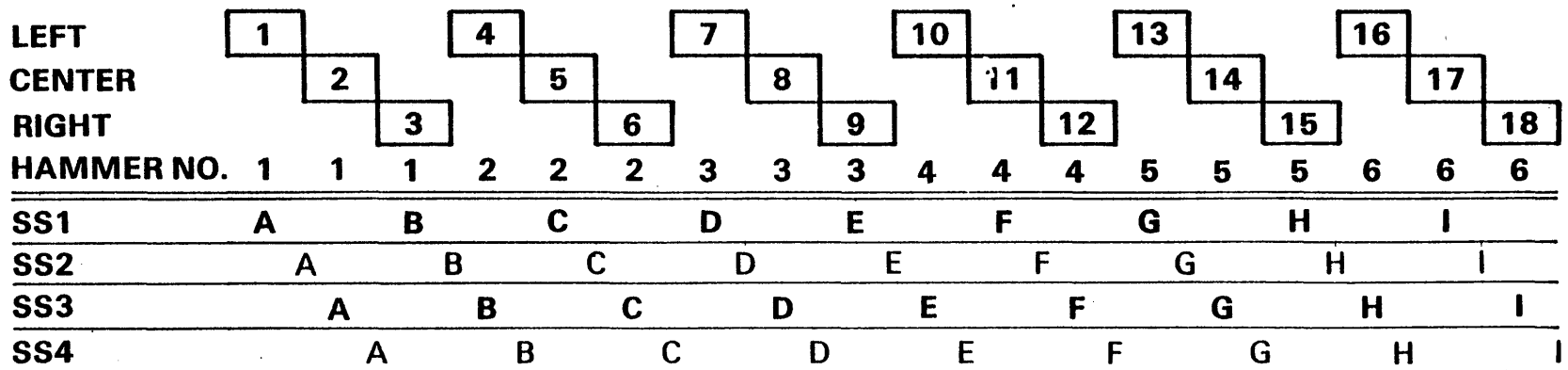


FIGURE 9-8. STANDARD AND COMPRESSED PITCH PRINT CYCLE

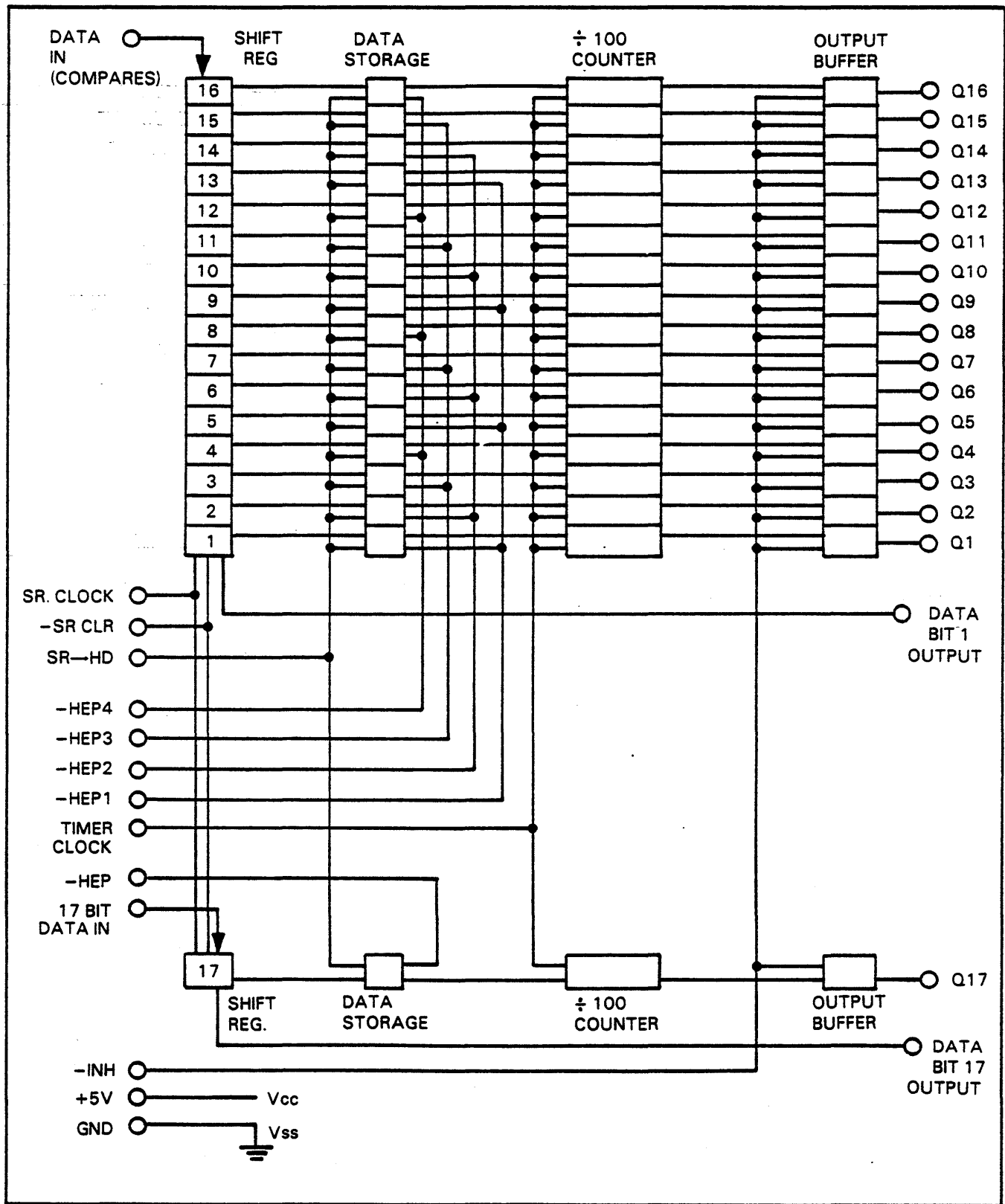


FIGURE 9-9. 17 POSITION HAMMER DRIVER TIMER

Specifications:

- a. 0.2 in. spacing between hammers
- b. 0.1 in. hammer face
- c. Power stroke - .061 in.
- d. Free flight - .06 in.
- e. Flight time - 1820 usec
- f. Hammer settle time - 35 msec max.
- g. Hammer bar horizontal shift -
(10 cpi) .100 in., (15 cpi) .066 in.
- h. Actuator coil resistance - 8.6 ohms
- i. Actuator arm closure time - 1480 usec
- j. Actuator spacing - .4 in. (2 rows)
- k. Maximum flight time adjustment - .03 in.

SECTION X FAULT ISOLATION AND SYSTEMS SAFETY

The printer's diagnostic display on the Control Panel will indicate a variety of statuses and or faults. The printer's software is such that it could display codes which are not listed. The majority of codes can be cleared by simply powering the printer OFF for a few seconds, then back ON. A list of codes is compiled in Section III of this manual. Codes which require Customer Engineer intervention are listed in this section and should be performed after reading Systems Safety following.

SYSTEMS SAFETY

Hazardous Voltages and Mechanisms

Maintenance of these printers requires the removal of protective covers provided to protect the customer and field service repairman from hazardous voltages and mechanisms. Maintenance on these printers shall only be performed by trained field service repairman who have been trained to work on these printers with the protective covers removed. Whenever possible during maintenance operations, disconnect the printer power cord from its external power source or switch off the printers main circuit breaker (ON/OFF switch). When power is applied to the printer during maintenance operations, care must be taken to avoid contact with hazardous voltages such as mains circuits and the high voltage section of power supplies.

On low voltage circuits, an additional hazard exists due to the high short circuit current/energy (often hundreds of amps) which can flow into a circuit and cause damage. Great care must be taken to avoid the short circuiting of these circuits by tools or personal metallic adornments such as rings or watchbands.

Handling of MOS Components:

MOS (Metal Oxide Silicon) components are present on the printed circuit boards in your printer. MOS components may be damaged by static electrical charges which are commonly generated by human movement such as walking over carpeted floors or by friction between clothing and chair seats or desk tops. Damage to MOS components may be minimized or eliminated if the following component and board handling precautions are observed.

MOS Component Handling:

1. Before handling MOS components, personnel should ground themselves via earth ground to the printer frame or other earthed metalwork.
2. MOS components should never be removed or installed on boards when printer power is ON.
3. MOS components should be stored in conductive trays (metal or foil lined containers) or have their pins joined by conductive foam.
4. High static materials should be excluded from the working area.

Handling of Printed Circuit Boards With MOS Component Installed:

1. The PCB must always be transported in the container provided.
2. There is no easy way of recognizing a MOS component, so if in doubt, assume that one is fitted to the PCB you are handling.
3. PCB's should never be installed or removed from the printer when the printer is powered ON.

4. When a replacement board is to be installed in a printer, the installer must first touch bare earthed metal frame to discharge any static electric charge he is carrying. Having done so, he should avoid taking any more steps on the floor prior to installing the PCB into the printer. He should then remove the PCB from its container, handling it in a way which avoids any contact with any conducting part of the PCB. He should then remove any protective clip, if fitted to the MOS device and insert the PCB.
5. Prior to removing a PCB, the person removing the PCB must again touch a bare earthed metal frame, avoid taking any further steps on the floor, remove the PCB from the printer, handling it as described above, fit protective clips where appropriate, and place the PCB in the container provided for the purpose.

Reconnecting Ground Straps After Servicing

All covers and major assemblies are grounded to the printer frame (earth ground) with ground straps. These ground straps are used to provide the printer with Electro Static Discharge and Safety Ground. Assure that all ground straps are reconnected to frame ground after servicing.

FAULT ISOLATION

Table 10-1 lists all of the C.E. Faults as they appear on the Control Panel's diagnostic display. Before attempting the replacement of a component or a board, power the printer OFF for a few seconds then power ON. If fault is still present, perform action item number 1 then 2, etc., until the fault is cleared.

SECTION XI LOGIC DIAGRAMS - PRINTER

These following Sections contain the Logic Diagrams for the entire printer. This section contains the Logic Diagrams for the printer less the I/O Adaptor and Personality Module. Section XII contains Logic Diagrams for the various I/O Adaptors. Section XIII contains Logic Diagrams for the various Personality Modules. The logic diagrams are presented in a signal index and modular logic format, which will be introduced and explained in this section.

SIGNAL INDEX AND MODULAR LOGIC INTRODUCTION

The logic for each printed circuit board is shown in a set of schematic diagrams. Each schematic set is called a logic module. In front of each logic module is a list of signals entering and leaving that particular printed circuit board. This list is called the signal index. These 2 elements make up the signal index and modular logic format. Some of the printed circuit boards will have a signal index and logic module. Other circuit boards will have the signal's input and output internal to the module without the signal index listing.

Figures 11-1 and 11-2 show examples of the signal index headings. Figure 11-3 shows the title block of the logic module. The following information will explain these Figures.

Figure 11-1

- (A) CROSS REF NO: This number designates which logic module is described by the signal index. The module numbers, locations and names are listed in Table 11-1.

- (B) PART NUMBER: This is the 8 digit part number of the signal index.
- (C) MODULE LOC: This code identifies the printed circuit board which the signal index is describing.
- (D) REV: This letter indicates the current revision level of the signal index.
- (E) SCHEMATIC NO: This is the 8 digit drawing number of the schematic diagrams for the logic module being described. It should match the number in block E of Figure 11-3.
- (F) MODULE INPUTS: This title indicates the signals listed below it are signals entering the board. Normally they enter on the left side of the schematic diagram.
- (G) SOURCE: This column indicates where each signal comes from. Signals coming from components will be shown like this: 1TB3, 3LO1, 4SW2. Signals coming from other boards will be shown like this: 0100-1BP1, 0200-1PC2, 0300-1PC3.
- (H) SIGNAL NAME: Self explanatory.
- (I) MODULE CROSS REF NO: This column indicates where the signal is found in the logic module. It will appear in this form: 0801-P1-44. 0801 is the number that will match block G of Figure 11-3. P1 is the connector on the printed circuit board, and 44 is the pin number of that connector.

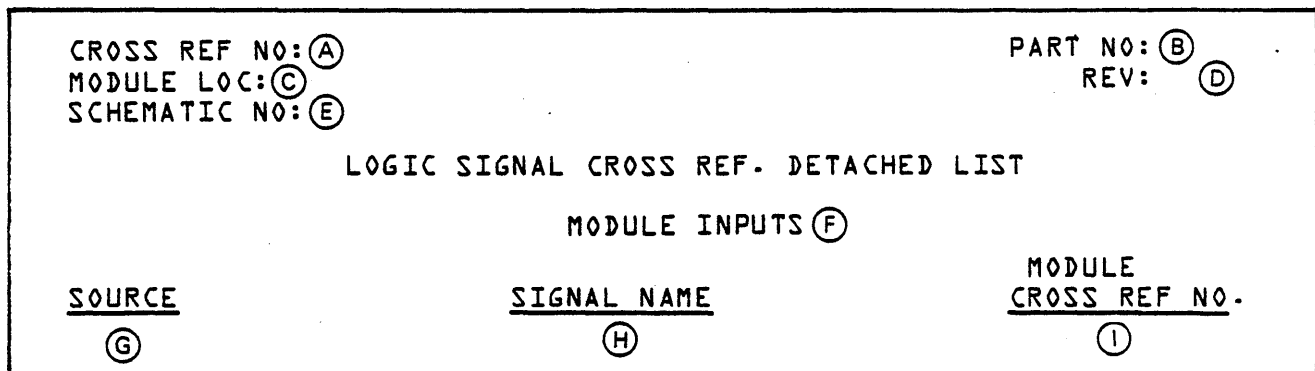


FIGURE 11-1. SIGNAL INDEX HEADING - INPUT

Figure 11-2

- (A) CROSS REF NO: This number designates which logic module is described by the signal index. The module numbers, locations and names are listed in Table 11-1.
- (B) PART NUMBER: This is the 8 digit part number of the signal index.
- (C) MODULE LOC: This code identifies the printed circuit board which the signal index is describing.
- (D) REV: This letter indicates the current revision level of the signal index.
- (E) SCHEMATIC NO: This is the 8 digit drawing number of the schematic diagrams for the logic module being described. It should match the number in block E of Figure 11-3.
- (F) MODULE OUTPUTS: This title indicates the signals listed below it are signals leaving the board. Normally they leave on the right side of the schematic diagram.
- (G) MODULE CROSS REF NO: This column indicates where the signal is found in the logic module. It will appear in this form: 0801-P1-44. 0801 is the number that will match block G of Figure 11-3. P1 is the connector on the printed circuit board, and 44 is the pin number of that connector.
- (H) SIGNAL NAME: Self explanatory.
- (I) DESTINATION: This column indicates where the signals are going. Signals going to components will be shown like this: 1TB3, 3LO1, 4SW2. Signals going to other boards will be shown like this: 0100-1BP1, 0200-1PC2, 0300-1PC3.

CROSS REF NO: (A)		PART NO: (B)
MODULE LOC: (C)		REV: (D)
SCHEMATIC NO: (E)		
LOGIC SIGNAL CROSS REF. DETACHED LIST		
MODULE OUTPUTS (F)		
<u>MODULE</u> <u>CROSS REF NO.</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
(G)	(H)	(I)

FIGURE 11-2. SIGNAL INDEX HEADING - OUTPUT

Figure 11-3

- (A) This is the title block of the schematic sheet and normally describes what is in the drawing.
- (B) This code identification block is for use by the manufacturing facility only.
- (C) This block indicates the size of the original drawing.
- (D) Some drawings show this 8 digit part number for the printed circuit board WITHOUT COMPONENTS.

- (E) This is the 8 digit part number assigned to the drawing set. See note above.
- (F) This block indicates the current revision level of the drawing.
- (G) This block is the reference find number for signals designated by I of Figure 11-1 and G of Figure 11-2.
- (H) This block indicates the individual sheets' numbered location within the complete set.
- (I) This block shows the module location. It should match C of Figures 11-1 and 11-2.

NOTE

DO NOT USE THIS NUMBER TO ORDER A REPLACEMENT FUNCTIONAL BOARD. REFER TO THE PARTS MANUAL FOR THE COMPLETED BOARD ASSEMBLY PART NUMBER.

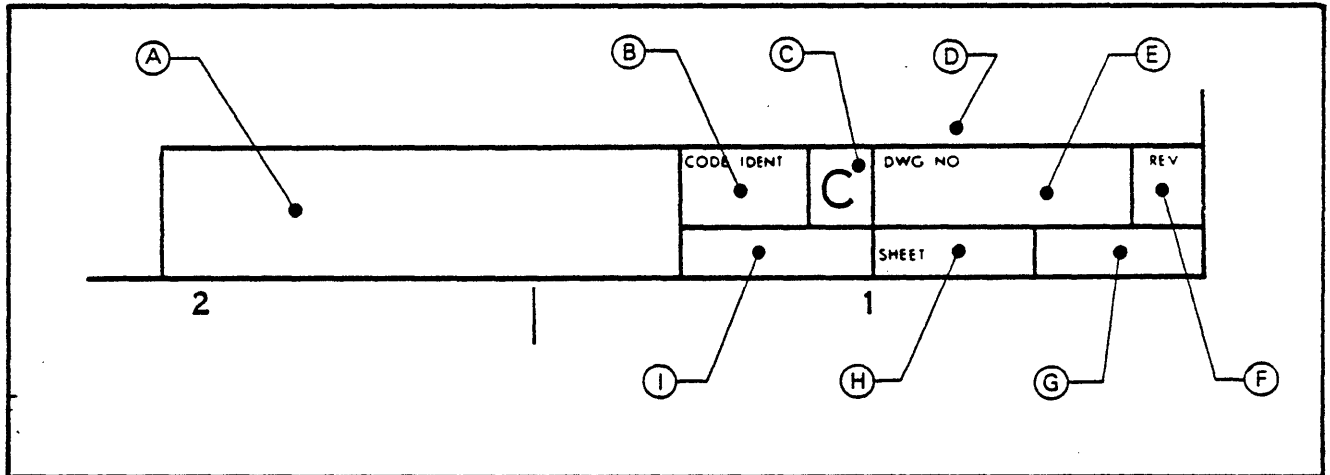


FIGURE 11-3. LOGIC MODULE TITLE BLOCK

TABLE 11-1. CROSS REF. NO. CODES

<u>CROSS REF. NO.</u>	<u>MODULE LOC.</u>	<u>NAME</u>
0100	1BP1	Backplane
0200	1PC2	CPU
0300	1PC3	Print Head Electronics
0400	1PC4	Hammer Driver
0500	5PC1	Control Panel
0600	1PC6	Input Power
0700	6PC1	Interface Adapter
0800	1PC1	Personality Module
0900	4PC1	AC Program
3100	7PC1	EVFU

GENERAL NOTES

- Each logic symbol in the schematic diagram reflects the function being performed, (A) component type, (B) and board location of the device (C). See Figure 11-4.
 - Information of device operation is available in the key to logic symbols, manual number 95390100.
 - All standard devices have the following DC power connections which are not shown as part of the logic symbols:
- | | | |
|---------------|--------------|---------------|
| 14 PIN DEVICE | FUNCTION | 16 PIN DEVICE |
| Pin 7 | Logic Ground | Pin 8 |
| Pin 14 | +5VDC | Pin 16 |
- Digital Logic Levels:

Input
 HI = greater than 2.0 VDC
 LO = less than 0.8 VDC

Output
 HI = greater than 2.4 VDC
 LO = less than 0.4 VDC

- DC Filtering:
 - Filter capacitors are generally located near the input power connections.
 - High frequency decoupling capacitors are located between devices, approximately 1 capacitor for every 3 devices.

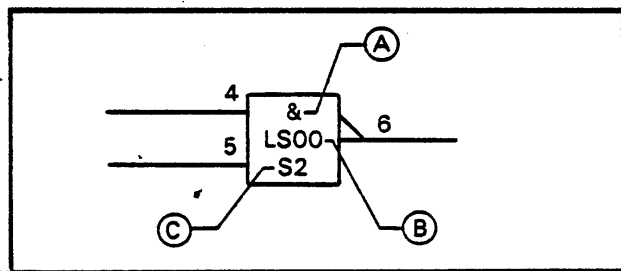
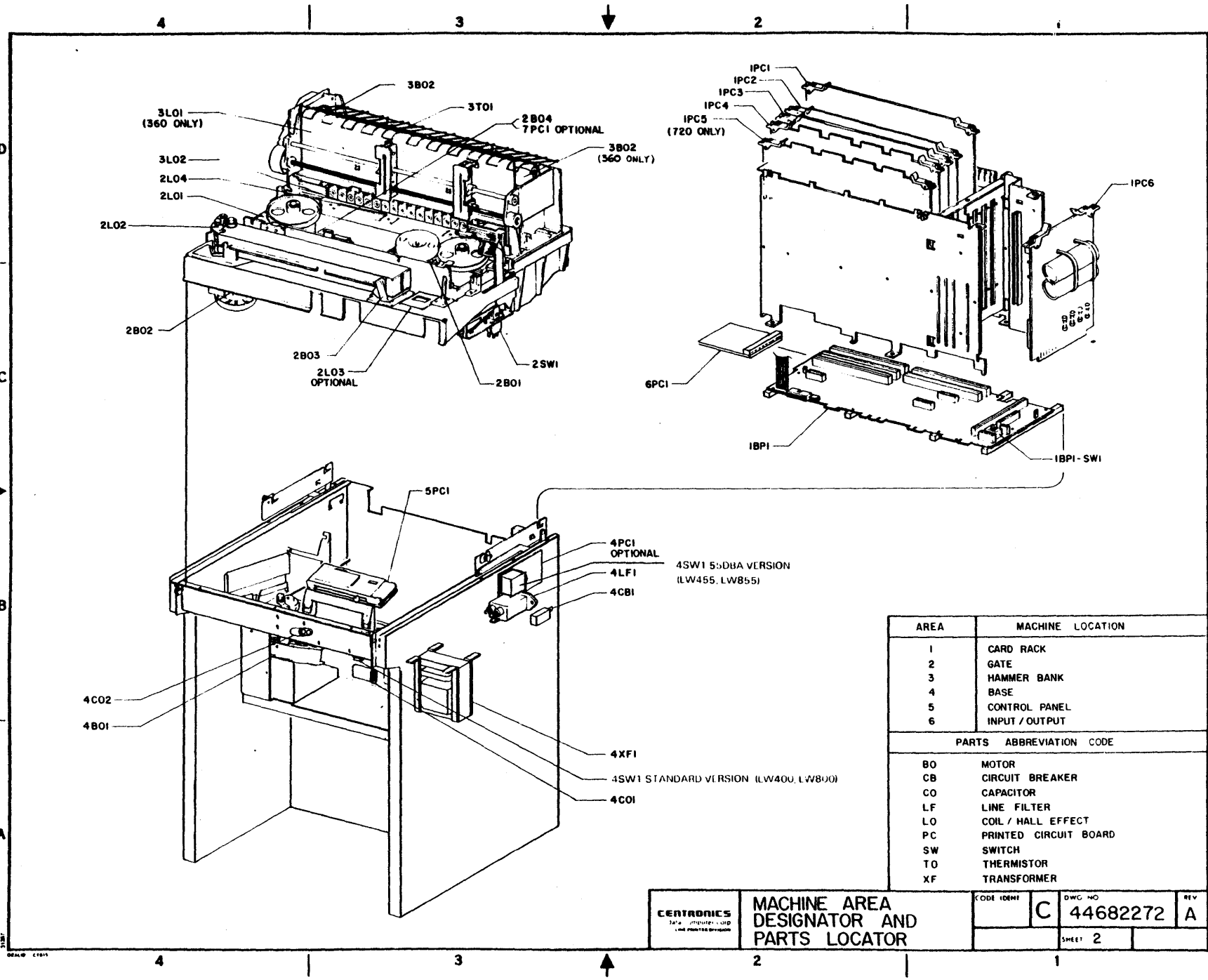


Figure 11-4. LOGIC SYMBOL

PRINTER SCHEMATICS

11-6

44682272



AREA	MACHINE LOCATION
1	CARD RACK
2	GATE
3	HAMMER BANK
4	BASE
5	CONTROL PANEL
6	INPUT / OUTPUT
PARTS ABBREVIATION CODE	
BO	MOTOR
CB	CIRCUIT BREAKER
CO	CAPACITOR
LF	LINE FILTER
LO	COIL / HALL EFFECT
PC	PRINTED CIRCUIT BOARD
SW	SWITCH
TO	THERMISTOR
XF	TRANSFORMER

CENTRONICS <small>DATA COMMUNICATIONS GROUP</small>	MACHINE AREA DESIGNATOR AND PARTS LOCATOR		CODE IDENT	DWG NO C 44682272	REV A
			SHEET 2		

SPECIAL Nomenclature

ABBREVIATION	DEFINITION	CROSS REF	ABBREVIATION	DEFINITION	CROSS REF
ALC B	ADDRESS LATCH INHIBIT BUFFER	C227	LD CP	LOAD COMPLETE	C227
ALC (0005)	ADDRESS LATCH INHIBIT	C227	LD EFCU	LOAD ELECTRONIC FORMAT UNIT	C227
ADD-7	ADDRESS DRIVE 7	C228	LD VCU	LOAD VERTICAL FORMAT UNIT	C209
AMS SEL	AUTO ONE HAND AMP SELECT	C228	LD CTR	LOAD IN PROCESS	C210
AUTO LF	AUTO LINE FEED	C228			C211
B DC 1	BUFFERED MEMORY DATA B 7	C228	MC	MISTAKE CLEAR	C201
BAND MTR	BAND MOTOR	C228	MEMCS	MEMORY CHIP SELECT	C204
BLKR FLT	BLACKER FAULT	C228	OOP RCR	OUT OF PAPER READER	C210
BMC	BAND MOTOR CONTROL	C228	OPT RAM CS	OPTIONAL RAM CHIP SELECT	C213
BMSR	BAND MOTOR SPEED ERROR	C228			
BOF	BOTTOM OF FORMS	C228	PERF SEL	PERFORATION SELECT	C210
BOI SEL	BUSS OVER INHIBIT	C228	PIP D	PRINT IN PROGRESS	C210
BSPV	BAND SYNC ERROR	C228	PII X	PAPER MOTION INDEX	C210
BST	BAND MOTOR	C228	PIV CLR FF	PAPER MOTION VERIFICATION CLEAR	C210
BUF RAM CS	BUFFER RAM CHIP SELECT	C213	POS D	POSITION 0	C210
			PRE CHAR PLS	PRE CHARACTER PULSE	C201
CECD	CONFIGURATION DATA	C228	PRH INH	PRINT INHIBIT	C201
CFP 9	CONFIGURATION PULSE	C228	PRH EN	PRINT ENABLE	C211
CHAN 1	CHANNEL 1	C228	PAP INH	POWER INHIBIT	C215
CHAN 1 I	CHANNEL 1	C228			
CHAN PLS	CHARACTER PULSE	C228	RD B	READ BUFFERED	C201
CHAMP FLT	CHAMP FAULT	C228	RD (I/O)	READ INPUT OUTPUT	C201
CLK 0	CLOCK 0	C228	RD ADV	RIBBON ADVANCE	C201
COMP	COMPARE	C228	RD FLT	RIBBON FAULT	C201
COMP PITCH	COMPRESSION PITCH	C228	RD MTR	RIBBON MOTOR	C201
CONF 0 TEST SEL	CONFIGURATION TEST SELECT	C228	RD MTR CS	READ ONLY MEMORY CHIP SELECT	C213
DS C 7	DATA BUSS 0 7	C228	SEAR S.W. GND	SEAR SWITCH GROUND	C201
DISP LATCH CS	DISPLAY LATCH CHIP SELECT	C213	SR HD	SHIFT REGISTER HAMMER DRIVER	C201
DISP LATCH	DISPLAY LATCH	C213	SR STEP 1	SHIFT REGISTER STEP	C214
DISP WR CS	DISPLAY WRITE CHIP SELECT	C213	SR S	START STOP PULSE	C206
			STAT BAND	STATISTICAL BAND	C206
			STAT SLC	STATISTICAL SEQUENCE	C206
ELC PLS	ELC PULSE	C228	START LAMP	START LAMP	C202
EN REP	ENABLE REPLY	C228	START LAMP	START LAMP	C202
ENRVE	ENTERV. ADVANCE	C228	STRP ENB	STEPPER ENABLE	C204
EXP 2	EXTENSION 2	C228	STRP FLT	STEPPER FAULT	C204
			STRREQ	STATUS REQUEST	C221
FORM CONT SEL	FORM CONTROL SELECT	C228			
FRACTION SEL 2	FRACTION SELECT 2	C228	TEST PRINT DAY SEC	TEST PRINT PATTERN SELECT	C204
FUSE FLT	FUSE FAULT	C228	TIMER INTER.	TIMER INTERRUPT	C217
			TEST SEL	TEST SELECT	C217
			TEST PRN LAMP	TEST PRINT LAMP	C211
HORZ C 1	HORIZONTAL MOTOR PHASE 1	C228			
HD 720	HAMMER DRIVER 720 PH	C228	V 0	VERTICAL TWO PHASE	C210
H HOLD	HORIZONTAL HOLD	C228	V 0 HOLD	VERTICAL HOLD	C210
HD CLK STD	HAMMER DRIVER CLOCK STANDARD	C228	V 1 PHASE 1	VERTICAL MOTOR PHASE 1	C210
HE ENB	HAMMER ENABLE PULSE	C228	V 2 PHASE 2	VERTICAL MOTOR PHASE 2	C210
HE ENB SYNC	HAMMER ENABLE PULSE SYNC	C228	V CLR	VERTICAL CLEAR UNIT MOTOR	C210
HE ENB THYR	HAMMER ENABLE THYRISTOR	C228	V FU STRB	VERTICAL FORMAT UNIT STROBE	C210
HFA IMPACT	HAMMER FAULT IMPACT	C228			
HFA TEST	HAMMER FAULT TEST	C228	WR B	WRITE BUFFERED	C202
HFA TEST 1	HAMMER FAULT TEST 1	C228			
HFA TEST 2	HAMMER FAULT TEST 2	C228	0048 CS	0048 CHIP SELECT	C213
HFA TEST 3	HAMMER FAULT TEST 3	C228	0255-5 CS	0255-5 CHIP SELECT	C213
HFA TEST 4	HAMMER FAULT TEST 4	C228	0155-2 CS	0155-2 CHIP SELECT	C213
HFA TEST 5	HAMMER FAULT TEST 5	C228	6 B SEL	6 B LINE SELECT	C204
HFA TEST 6	HAMMER FAULT TEST 6	C228	6 L LAMP	6 L LINE PER LAMP	C204
HFA TEST 7	HAMMER FAULT TEST 7	C228	720 HAMM VOLT FLT	720 HAMMER VOLTAGE FAULT	C210
HFA TEST 8	HAMMER FAULT TEST 8	C228	720 LINES PER MINUTE	720 LINES PER MINUTE	C210
HORZ 2P	HORIZONTAL 2 PHASE	C228	36V REG INH	36 VOLT REGULATOR INHIBIT	C202
HORZ PHASE	HORIZONTAL PHASE	C228			
HORZ RFR	HORIZONTAL READER	C228			
INT CNP.	INTERSECTION COMPLETE	C211			
INTRDR	INTERNAL ADDRESS	C211			
INTR	INTERNAL ADDRESS	C211			
IO FAULT	INTERNAL ADDRESS FAULT	C211			
IO (0005)	INTERNAL ADDRESS (0005)	C211			
IO PORT 1 CS	INTERNAL ADDRESS PORT 1 CHIP SELECT	C211			

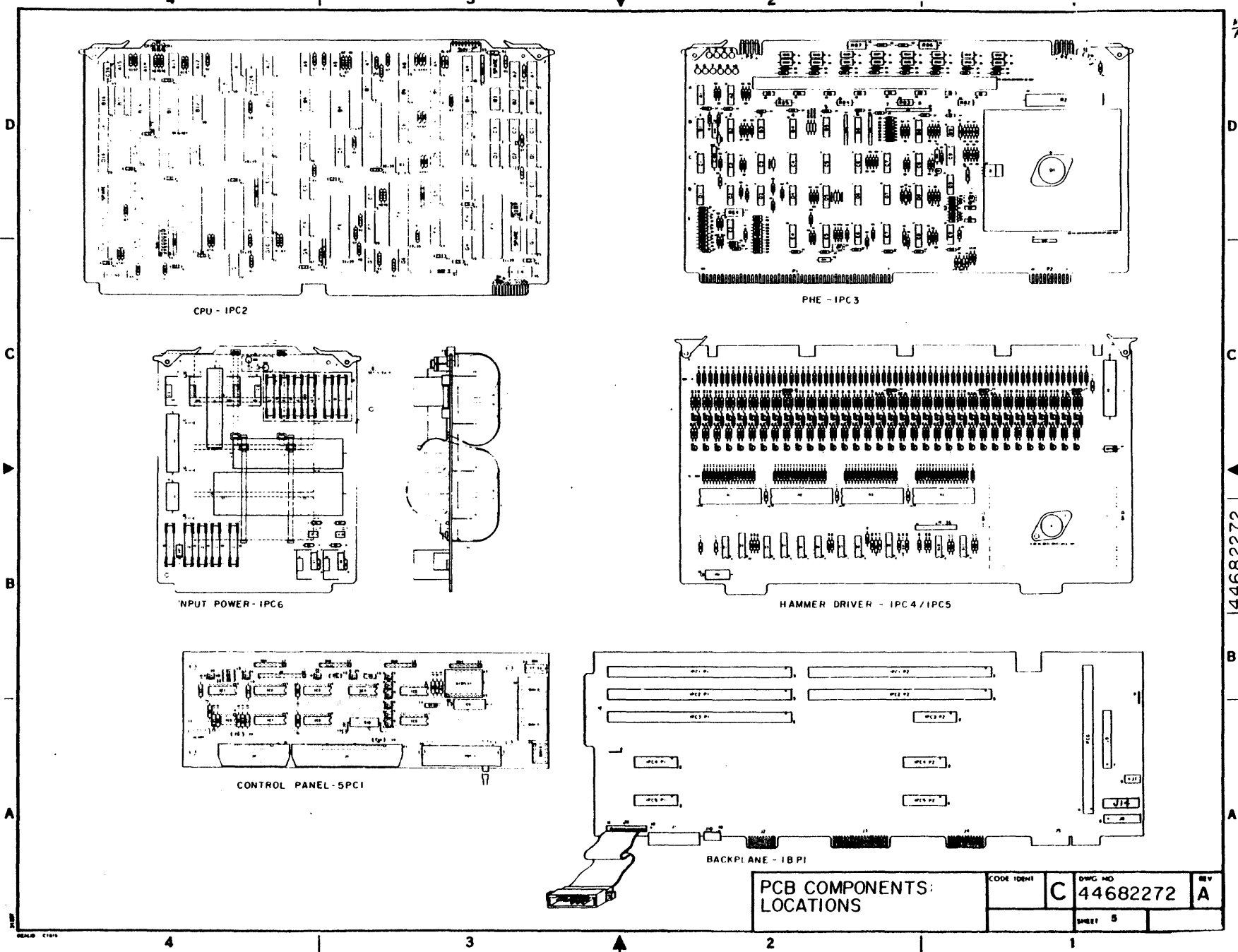
11-7/11-8

APRIL '85

SPECIAL Nomenclature		FORM NO.	REV
		100011000-01	A
SHEET 4		CROSS REF NO	

11-9

APRIL '85



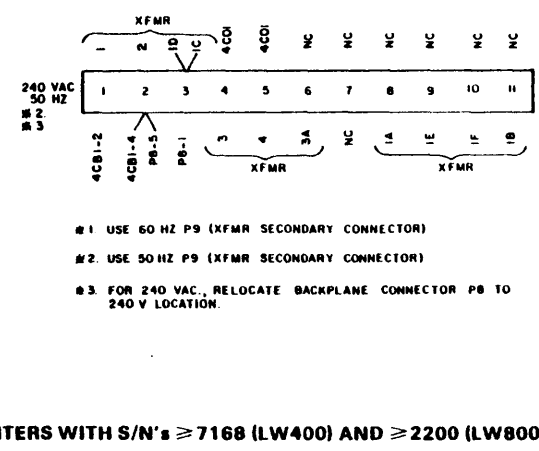
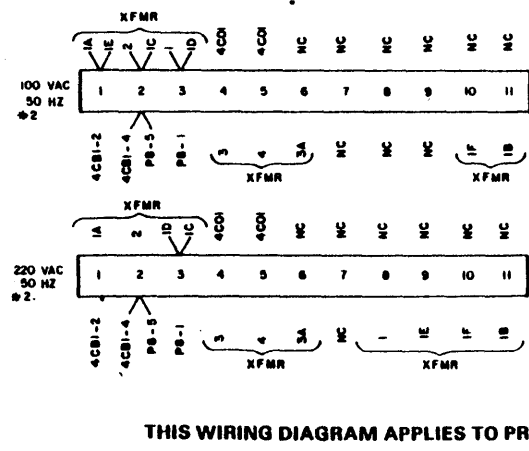
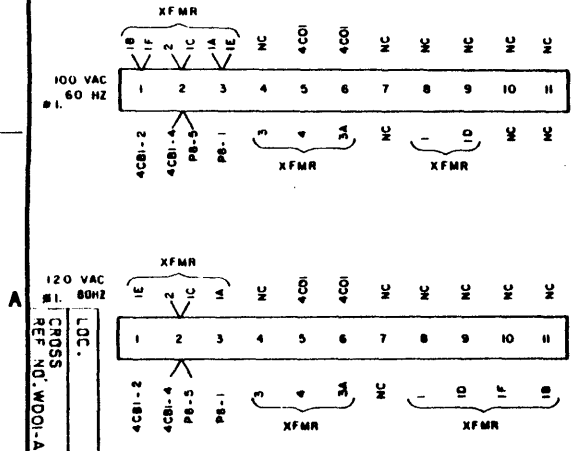
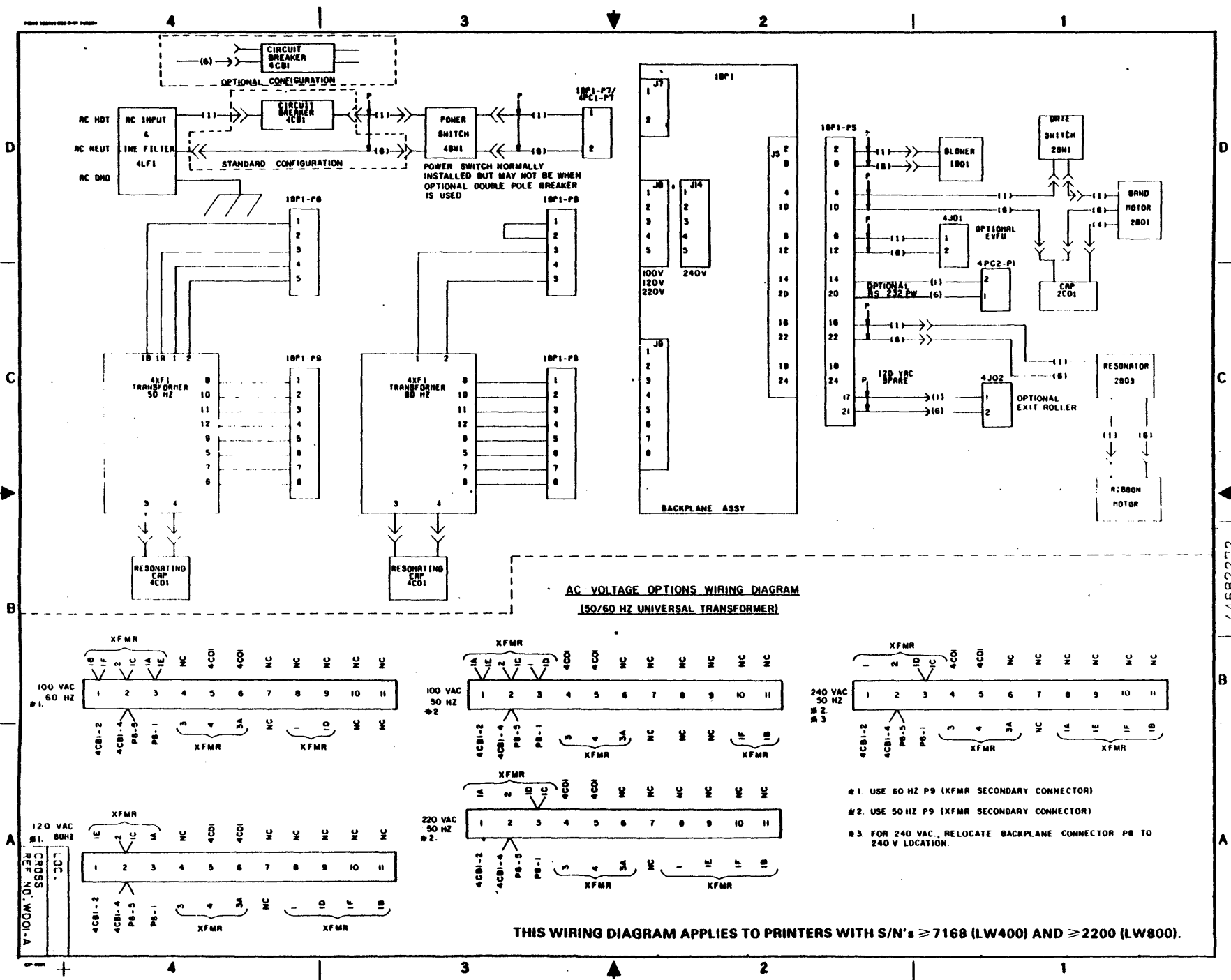
PCB COMPONENTS:
LOCATIONS

CODE IDENT	C	DWG NO	44682272	REV	A
		SHEET	5		

44682272

11-9B

APRIL 85



- #1 USE 60 HZ P9 (XFMR SECONDARY CONNECTOR)
- #2. USE 50 HZ P9 (XFMR SECONDARY CONNECTOR)
- #3. FOR 240 VAC., RELOCATE BACKPLANE CONNECTOR PB TO 240 V LOCATION.

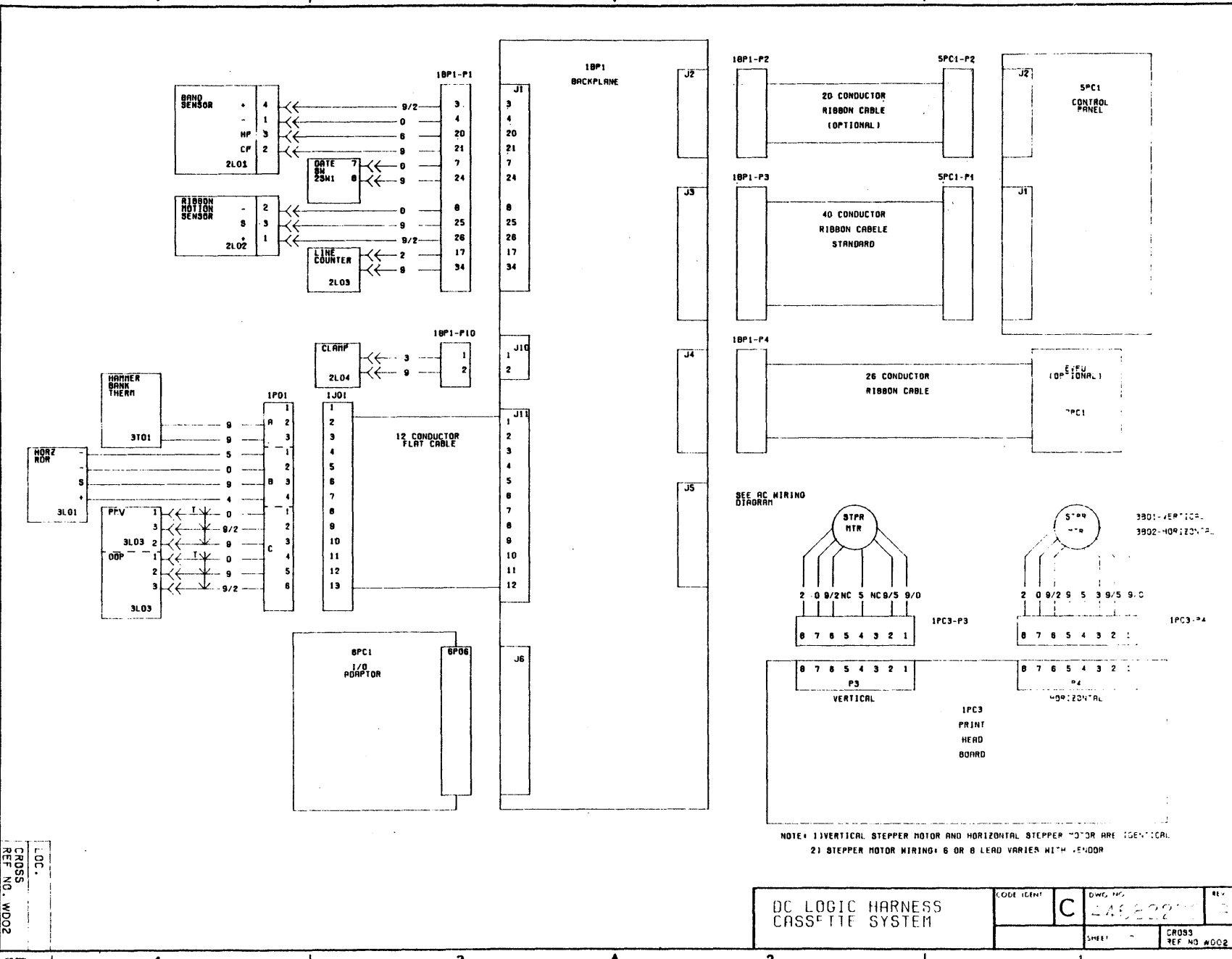
THIS WIRING DIAGRAM APPLIES TO PRINTERS WITH S/N's ≥ 7168 (LW400) AND ≥ 2200 (LW800).

44682272

4 | 3 | 2 | 1

D
C
B
A

D
C
B
A



11-10

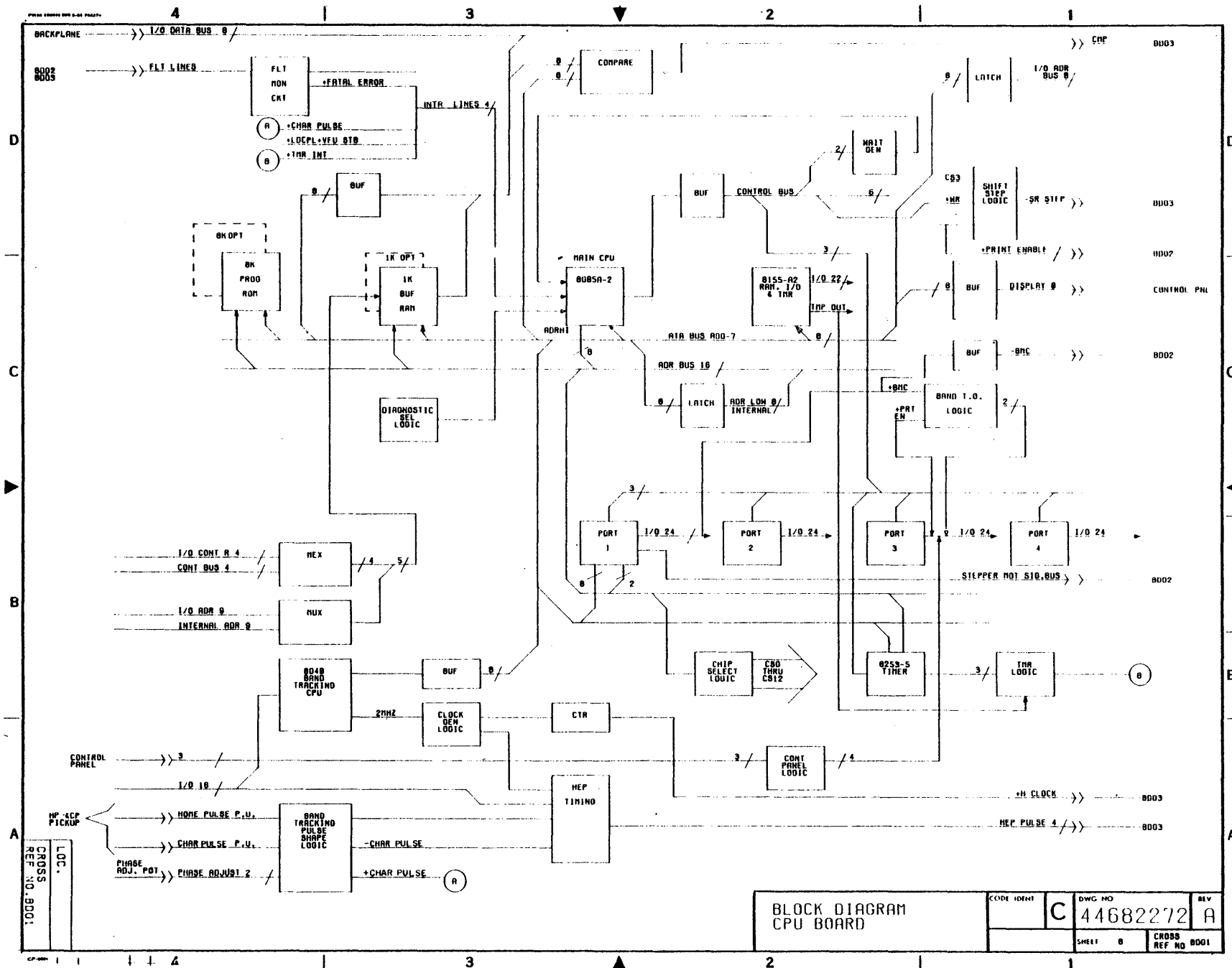
APRIL '85

44682272

A

DC LOGIC HARNESS CASSETTE SYSTEM		CODE IDENT	C	DWG. NO.	44682272	REV.	1
		SHEET		CROSS REF. NO.	W002		

11-11



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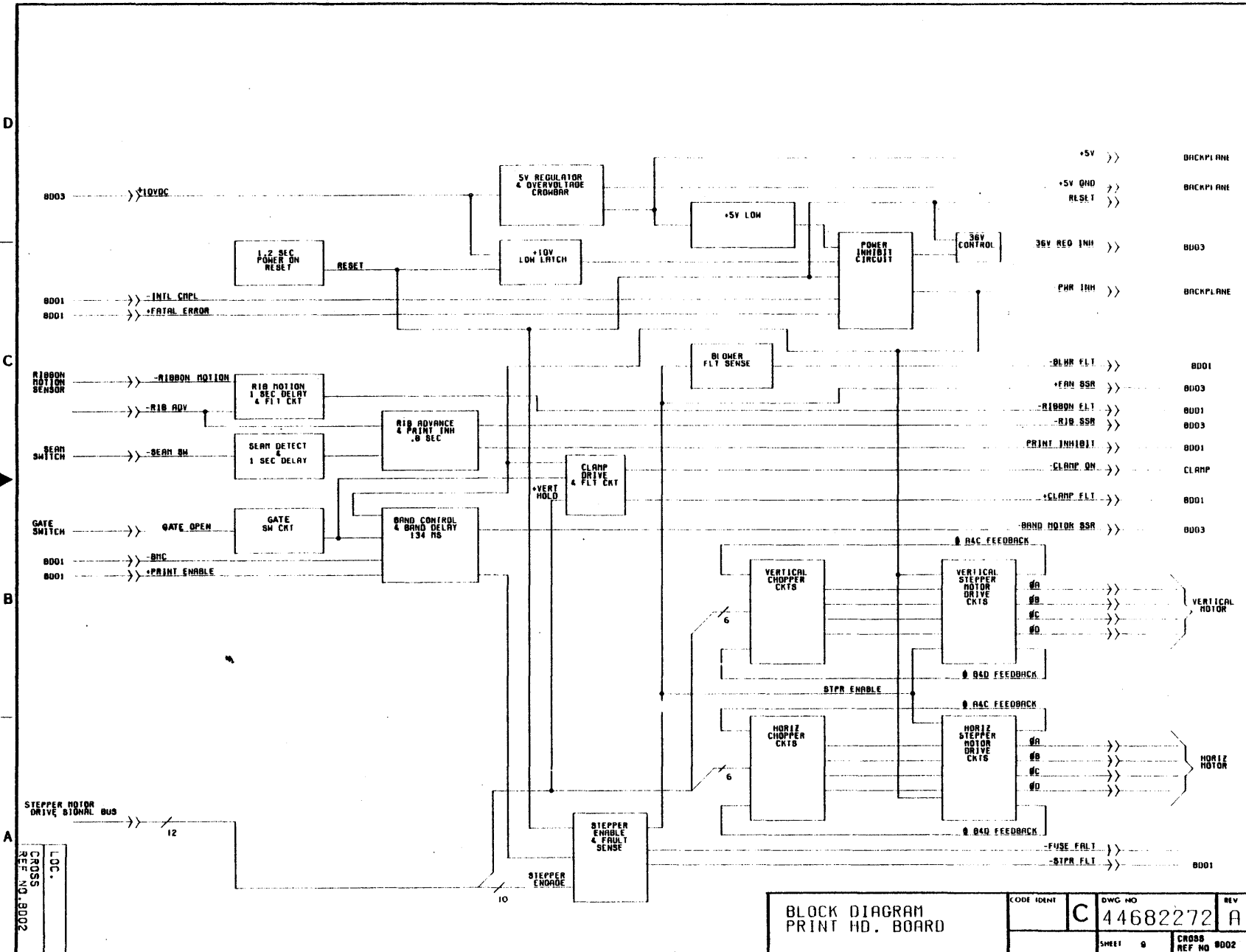
B

B

A

A

11-12



CROSS REF NO 0002
LOC.
CROSS REF NO 0002

BLOCK DIAGRAM
PRINT HD. BOARD

CODE IDENT	C	DWG NO	44682272	REV	A
SHEET	0	CROSS REF NO	0002		

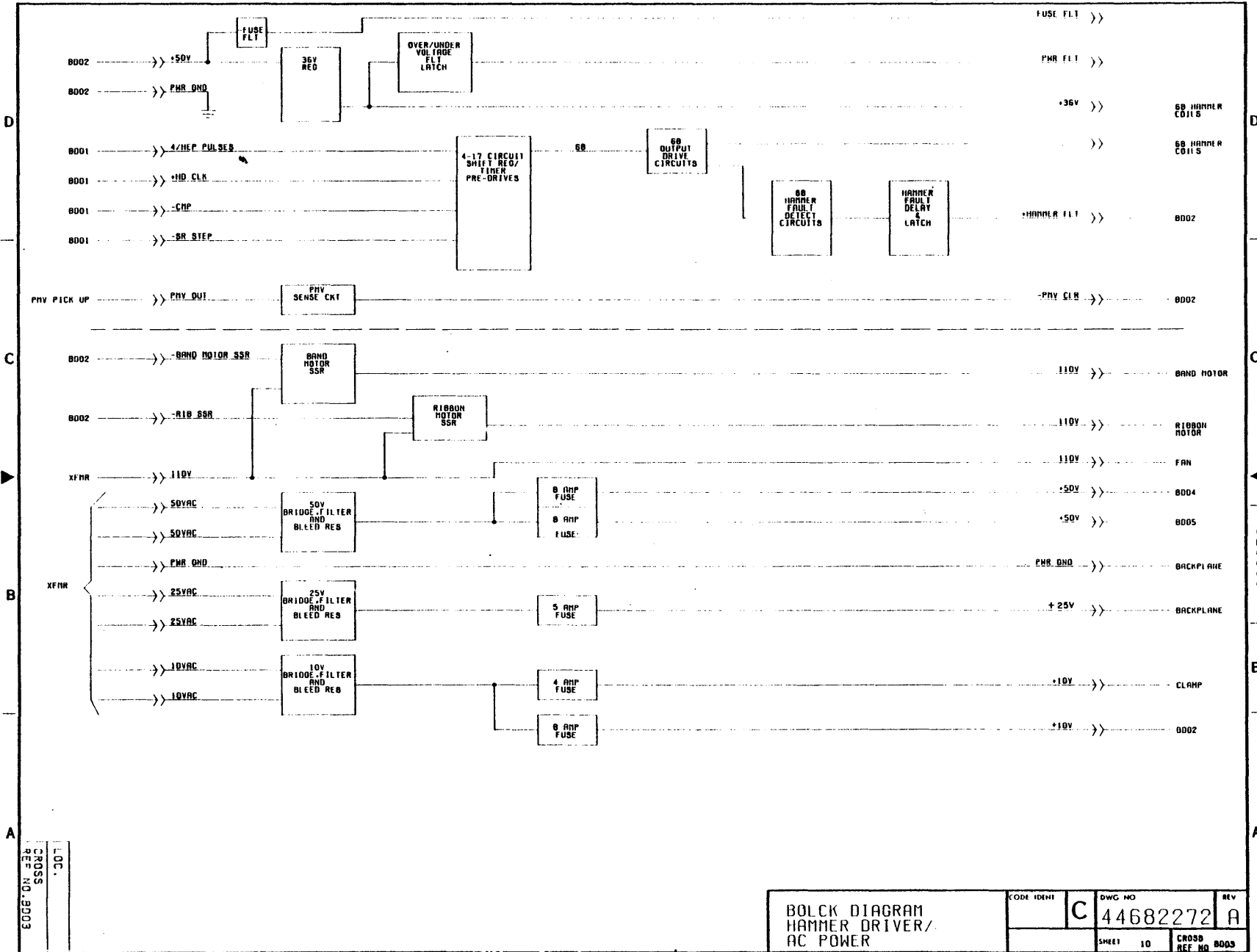
44682272

4

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11-13

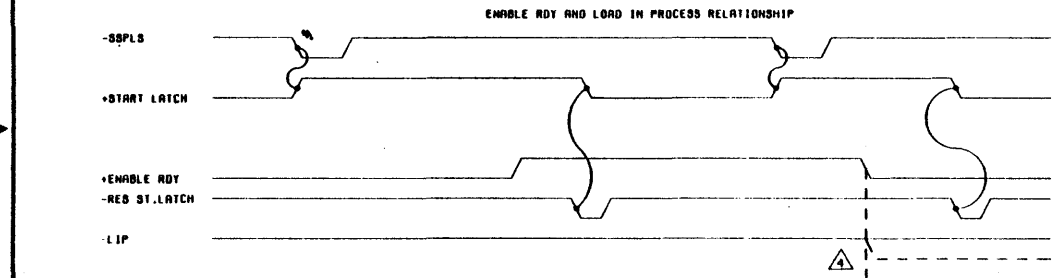
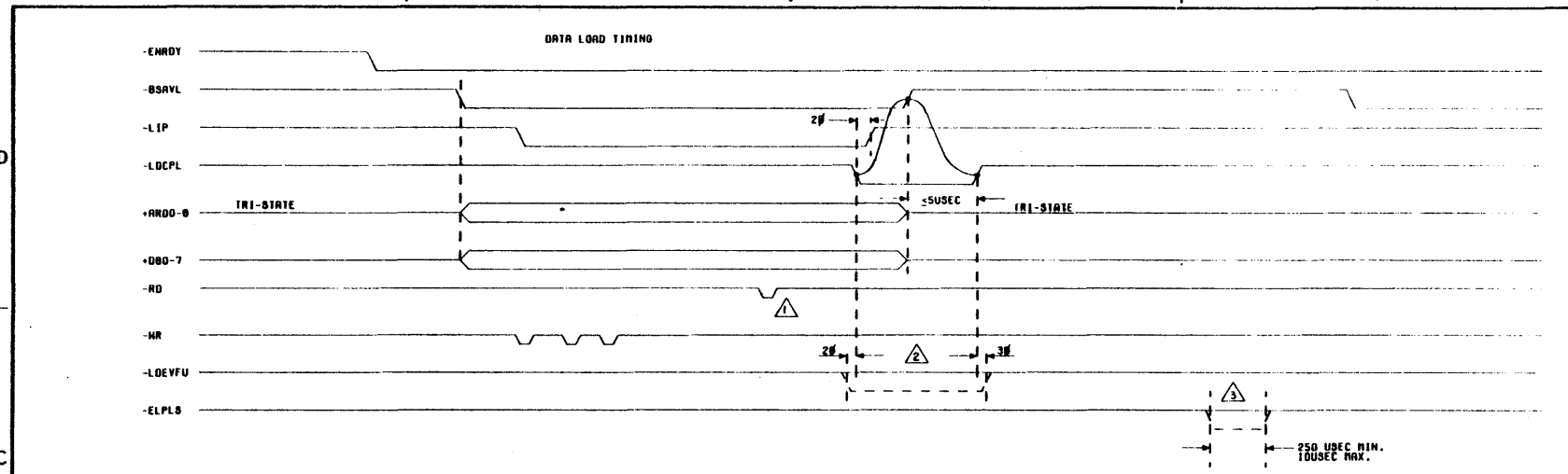
44682272

LOC.
CROSS
REF. NO. B003

BOLCK DIAGRAM
HAMMER DRIVER/
AC POWER

CODE IDENT	C	DWG NO	44682272	REV	A
SHEET	10	CROSS REF NO	B003		

4 | 3 | 2 | 1



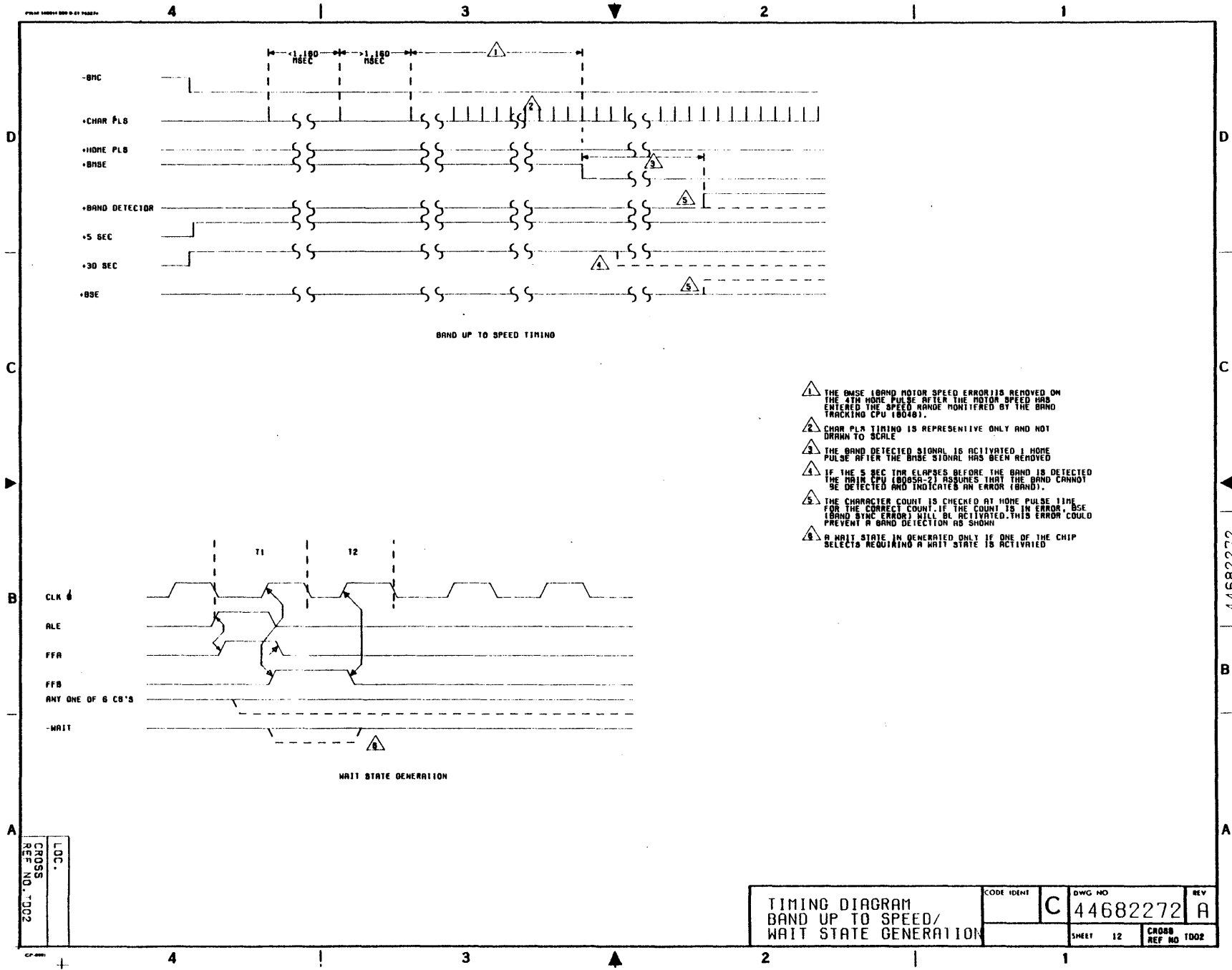
- ① THE -RD IS OPTIONAL, IT WOULD TYPICALLY BE GENERATED ONLY IF A STATUS BYTE READ IS REQUIRED
- ② THE -LDEVFU SIGNAL IS ONLY PLACED ACTIVE LOW IF THE DATA BEING LOADED IS AN EVFU LOAD VERSUS PRINT DATA
- ③ IF THE DATA LOADED IS EVFU DATA, AN -ELPLS WILL BE GENERATED PRIOR TO THE -DSAYL BEING PLACED ACTIVE IF THE EVFU DATA WAS LOADED SUCCESSFULLY
- ④ ENABLE RDY GOING INACTIVE MUST PREVENT -LIP FROM BECOMING ACTIVE IF PREVIOUSLY INACTIVE

11-14

44682272

LOC.
CROSS
REF NO. 7001

TIMING DIAGRAM DATA LOAD TIMING		CODE IDENT C	DWG NO 44682272	REV A
		SHEET 11	CROSS REF NO TDOI	



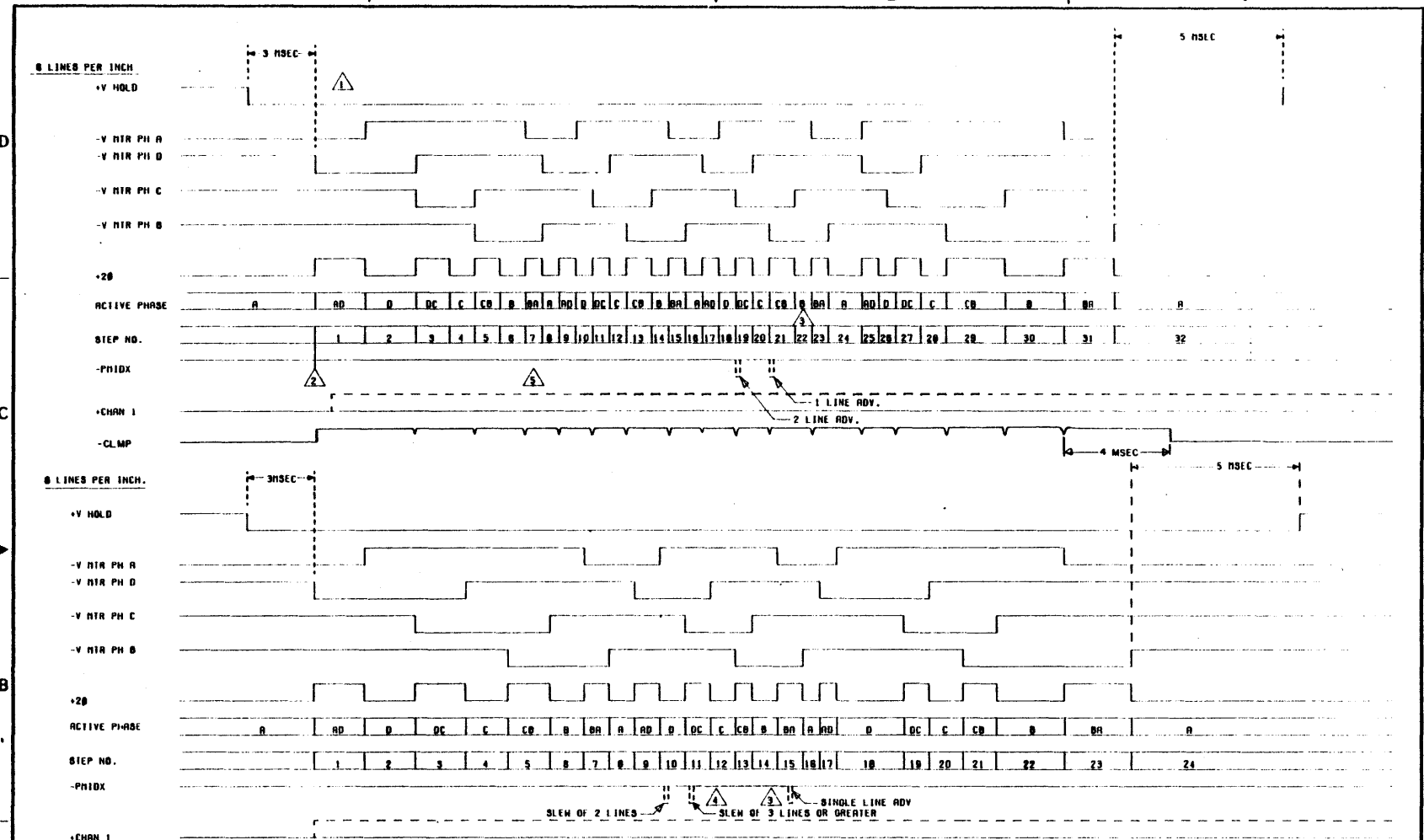
- ⚠ THE BMSB (BAND MOTOR SPEED ERROR) IS REMOVED ON THE 4TH HOME PULSE AFTER THE MOTOR SPEED HAS ENTERED THE SPEED RANGE MONITORED BY THE BAND TRACKING CPU (B0040).
- ⚠ CHAR PLS TIMING IS REPRESENTATIVE ONLY AND NOT DRAWN TO SCALE.
- ⚠ THE BAND DETECTED SIGNAL IS ACTIVATED 1 HOME PULSE AFTER THE BMSB SIGNAL HAS BEEN REMOVED.
- ⚠ IF THE 5 SEC TMR ELAPSES BEFORE THE BAND IS DETECTED THE MAIN CPU (B005A-2) ASSUMES THAT THE BAND CANNOT BE DETECTED AND INDICATES AN ERROR (BAND).
- ⚠ THE CHARACTER COUNT IS CHECKED AT HOME PULSE 11NE FOR THE CORRECT COUNT. IF THE COUNT IS IN ERROR, BSE (BAND SYNC ERROR) WILL BE ACTIVATED. THIS ERROR COULD PREVENT A BAND DETECTION AS SHOWN.
- ⚠ A WAIT STATE IS GENERATED ONLY IF ONE OF THE CHIP SELECTS REQUIRING A WAIT STATE IS ACTIVATED.

11-15

44682272

LOC.
CROSS
REF. NO. 1002

TIMING DIAGRAM BAND UP TO SPEED/ WAIT STATE GENERATION		CODE IDENT	C	DWG NO	44682272	REV	A
		SHEET	12	CROSS REF NO	1002		



- △ THE TIMING CHART DEPICTS A SINGLE LINE SPACE OF PAPER MOTION AT 8 OR 6 LINES PER INCH.
- △ THE -CHAN I SIGNAL WILL ONLY BE GENERATED IF THE LINE SPACE IN PROCESS WILL MOVE THE PAPER TO THE TOP OF FORM (TOP) POSITION.
- △ FOR MULTILINE SLEWS GREATER THAN 2 LINES THE STEP DURATION BECOMES CONSTANT AT STEP COUNT 15 OF THE SECOND LINE.
- △ FOR MULTILINE 6 LPI SLEWS GREATER THAN 2 LINES THE STOP DECISION POINT (AND THE GENERATION OF -PHIDX) CHANGES TO COUNT 11. ALSO THE DECEL RAMP BECOMES IDENTICAL TO THE 6 LPI DECEL RAMP COUNTS 21 TO 32.
- △ FOR MULTILINE SLEWS THE STEP DURATION BECOMES CONSTANT AT COUNT 7 OF THE SECOND LINE.

LOC.
 CROSS REF NO. 1003

TIMING DIAGRAM VERTICAL STEPPER		CODE IDENT C	DWG NO. 44682272	REV A
		SHEET 13	CROSS REF NO	TDD9

11-16

44682272

4

3

2

1

STD. PITCH

+H HOLD

-HATR PH A

-HATR PH B

-HATR PH C

-HATR PH D

+2θ

ACTIVE PHASE

+POS I

+POS O

COMP. PITCH

+H HOLD

+HATR PH A

+HATR PH B

+HATR PH C

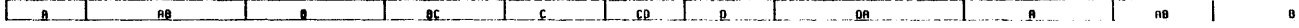
+HATR PH D

+2θ

ACTIVE PHASE

+POS I

+POS O



	STD. PITCH		COMP. PITCH	
	+POS I	+POS O	+POS I	+POS O
PRINT POSITION I	0	0	0	0
PRINT POSITION II	0	1	0	1
PRINT POSITION III	N.A.	N.A.	1	0

△ TIMING CHART REPRESENTS THE START OF A HORIZ. MOTION WITH ROTOR PHASE A APPLIED WITH THE HAMMER BANK IN THE HOME POSITION (+POS0-POS1:0)

△ TIMING CHART SHOWS RELATIONSHIP OF PHASES. FOR SPECIFIC TIMES BETWEEN STEPS SEE THE APPROPRIATE SOFTWARE LISTING FOR HORIZ. MOTION

11-17

44682272

LOC.
CROSS
REF. NO. 1004

TIMING DIAGRAM
HORIZONTAL STEPPER

CODE IDENT	C	DWG NO	44682272	REV	A
SHEET	14	CROSS REF NO	1004		

4

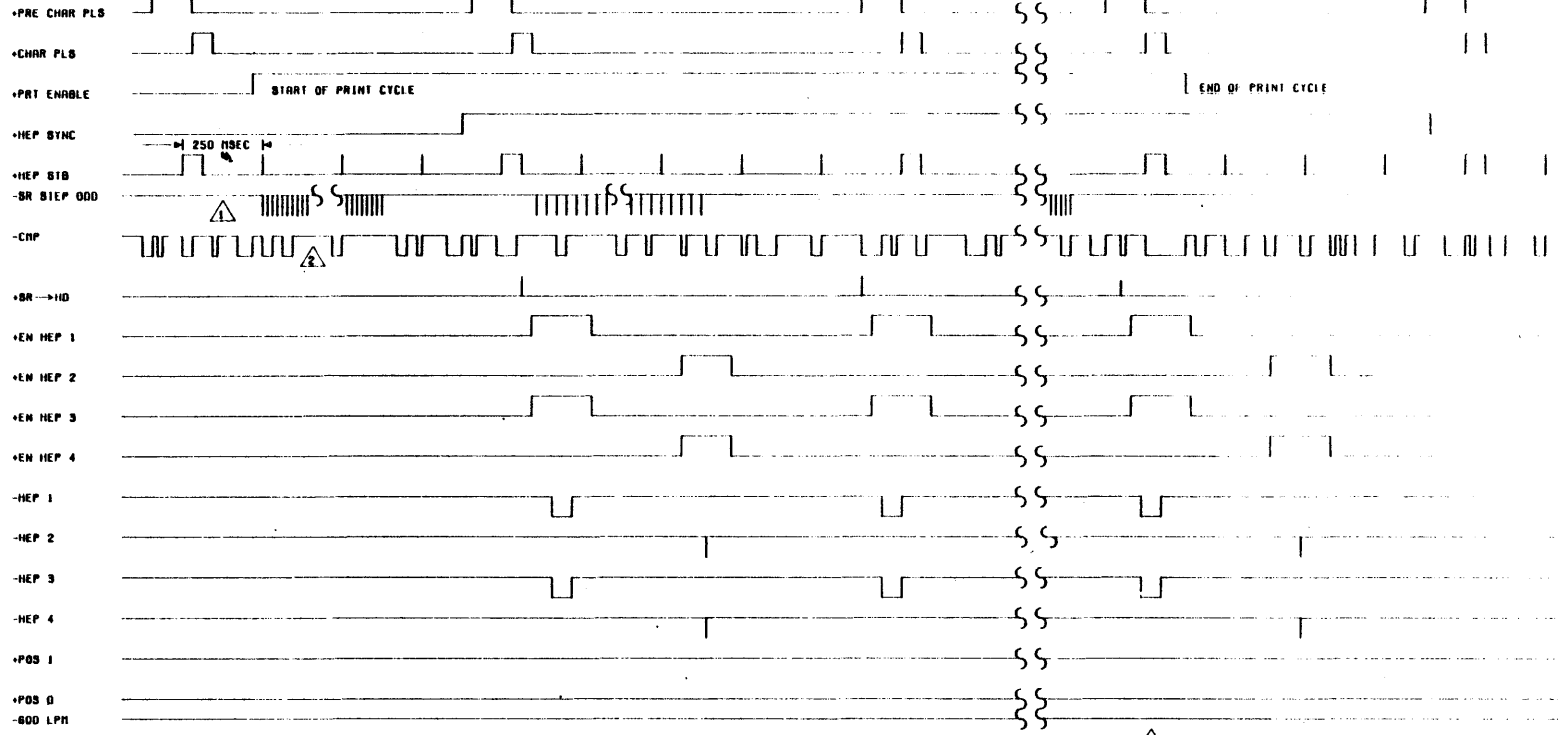
3

2

1

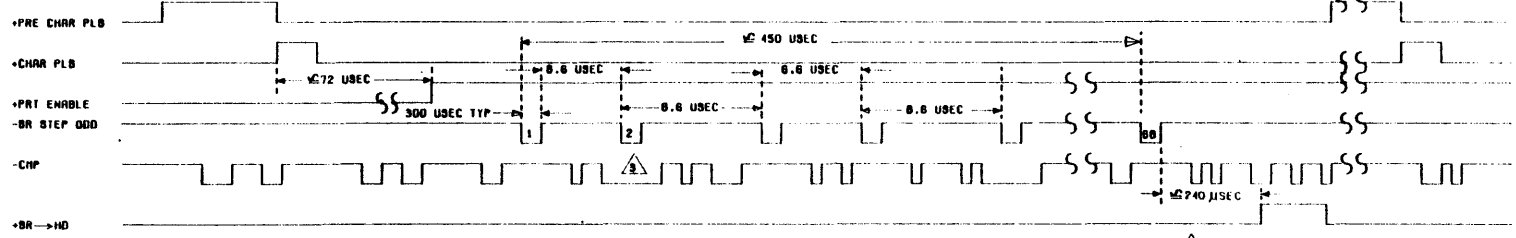
4 | 3 | 2 | 1

PRINT TIMING



⚠ A TOTAL OF 60 BR STEP PULSES OCCUR FOR EACH SCAN.
 ⚠ THE -CMP LINE IS ONLY VALID WHEN THE -BR LINE IS ACTIVE

COMPARE TIMING



⚠ THE -CMP LINE IS ONLY VALID WHEN THE -BR STEP ODD PULSE IS ACTIVE

11-18

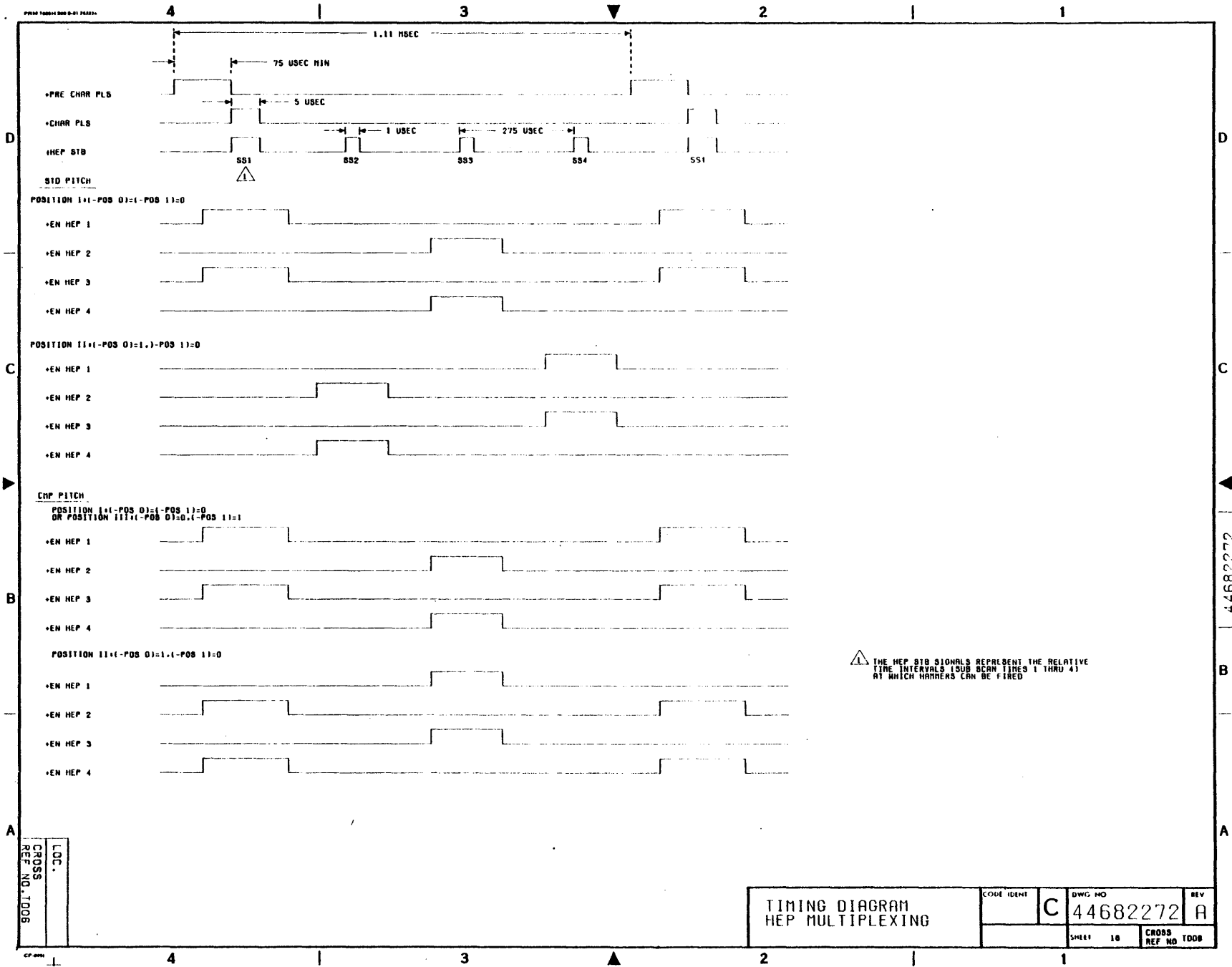
44682272

LOC.
 CROSS
 REF. NO. 1005

TIMING DIAGRAM
 PRINT TIMING AND
 COMPARE PULSE

CODE IDENT	C	DWG NO	44682272	REV	A
SHEET	15	CROSS REF NO	1005		

4 | 3 | 2 | 1

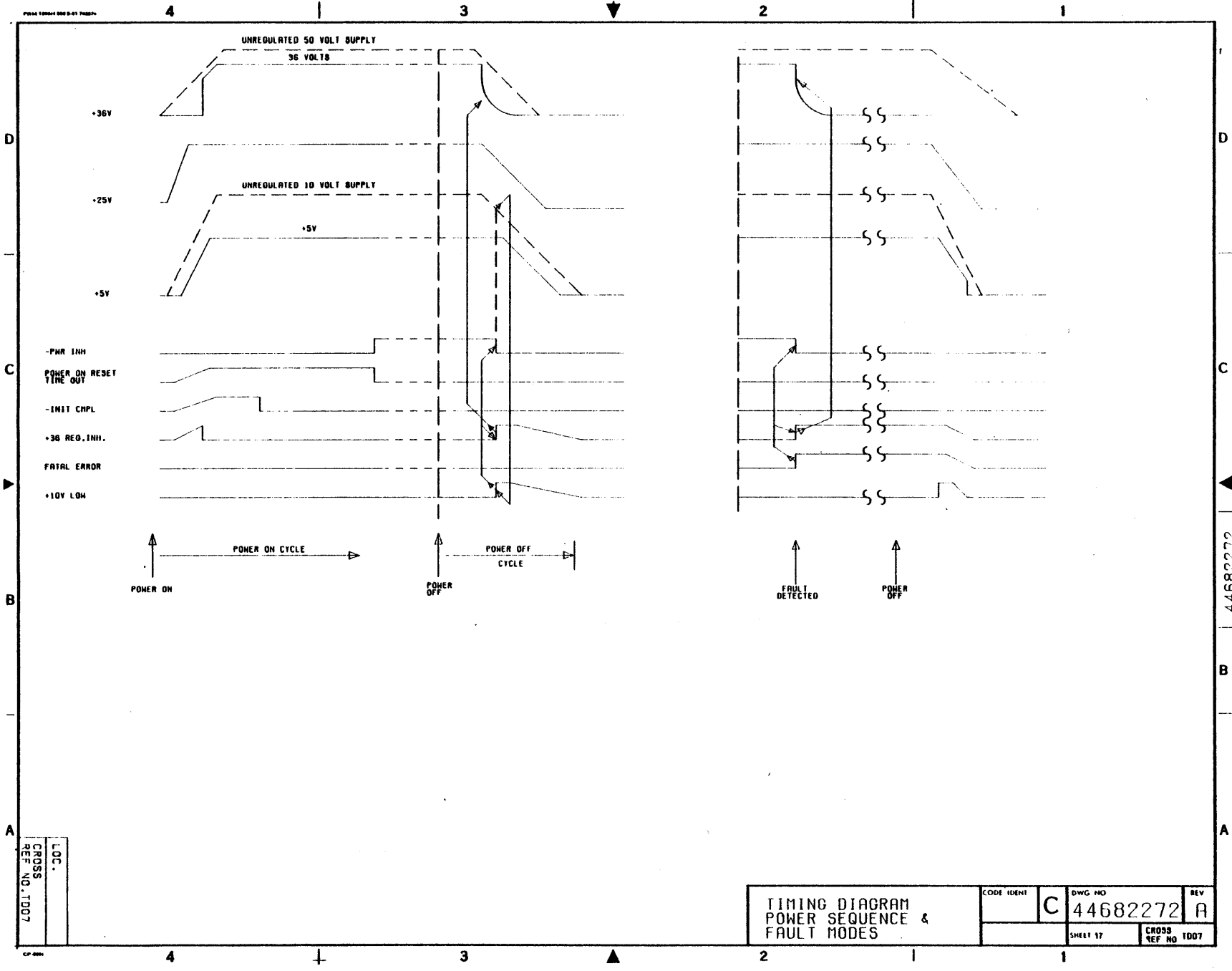


11-19

44682272

LOC.
CROSS
REF. NO. 1006

TIMING DIAGRAM HEP MULTIPLEXING		CODE IDENT C	DWG. NO. 44682272	REV A
		SHEET 10	CROSS REF. NO. 1006	



11-20

44682272

LOC.
CROSS
REF. NO. 1D07

TIMING DIAGRAM
POWER SEQUENCE &
FAULT MODES

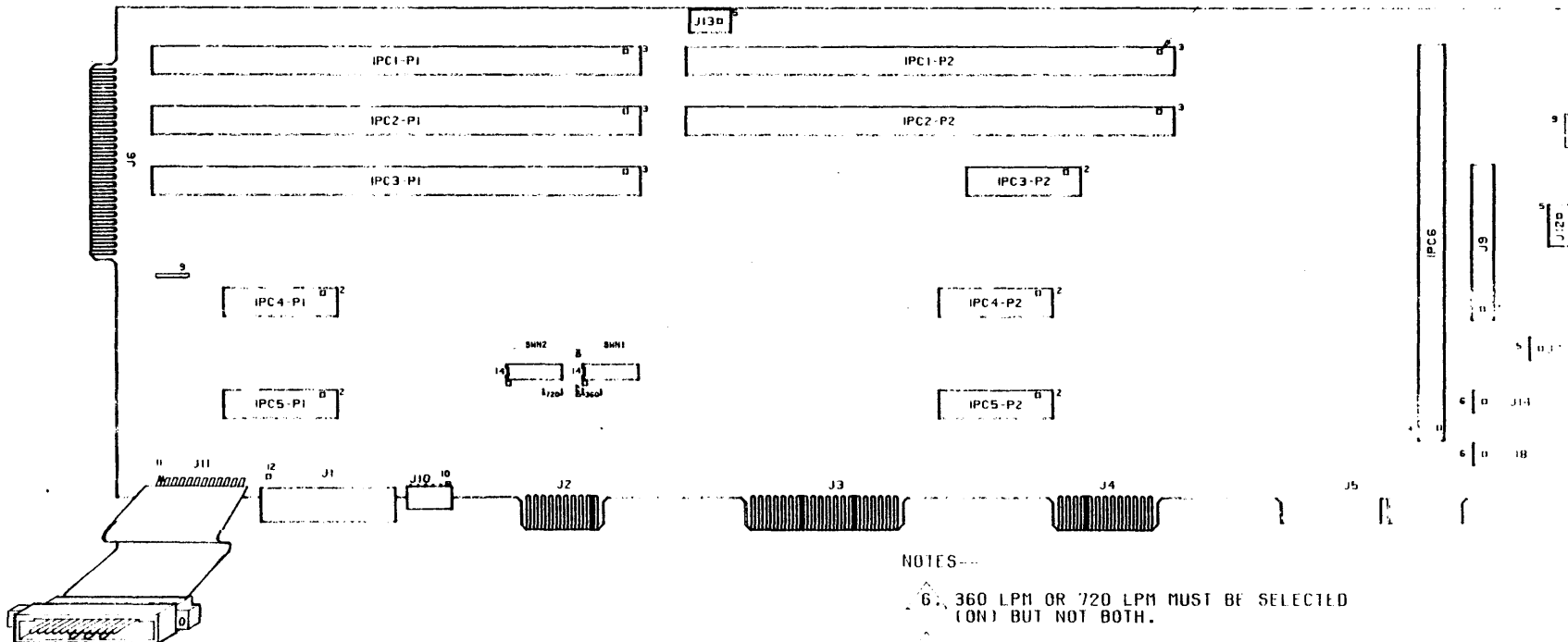
CODE IDENT	DWG NO	REV
	C 44682272	A
	SHEET 17	CROSS REF NO 1D07

PART NO.	TYPE	IPC5-P1	SW1	SW2	J12	J13
4685879	BASIC	NO	YES	NO	NO	NO
4685880	OPTIONAL	YES	YES	YES	NO	NO

SW. NO.	FUNCTION	NOTE
1	360 LPM	
2	360 LPM	
3	360 LPM	
4	I/O CONVERTED EVFU	
5	QUIET CABINET	
6	QUIET CABINET	
7	5V OPTION	
8	5V OPTION	

SW. NO.	FUNCTION	NOTE
1	UNUSED	
2	UNUSED	
3	UNUSED	
4	UNUSED	
5	UNUSED	
6	720 LPM	
7	720 LPM	
8	720 LPM	

11-21

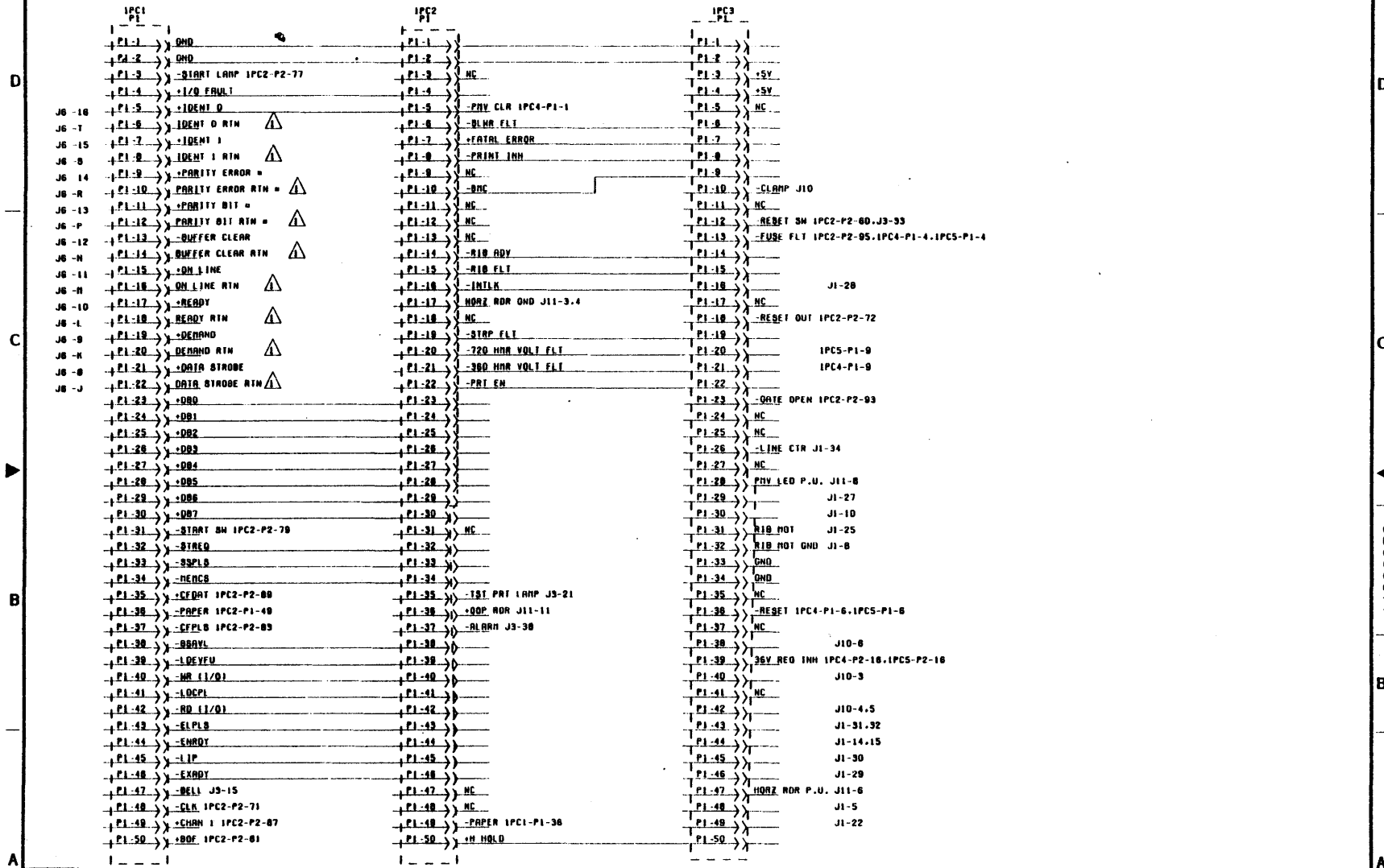


NOTES---

6. 360 LPM OR 720 LPM MUST BE SELECTED (ON) BUT NOT BOTH.
7. SW 4 IS OPENED (OFF) ONLY WHEN TAPE FORMAT IS CONVERTED BY THE I/O.
8. SW 5 IS CLOSED (ON) ONLY WHEN EXIT ROLLERS ARE USED.
SW 6 IS OPENED (OFF) ONLY WHEN EXIT ROLLERS ARE USED.
9. SW 7 AND SW 8 ARE OPENED (OFF) ONLY WHEN CONTROL PANEL IS POWERED FROM OPTIONAL 5 VOLT SUPPLY.

BACKPLANE PCB ASSEMBLY

* NOT USED IN PRINTERS WITHOUT PARITY



11-22

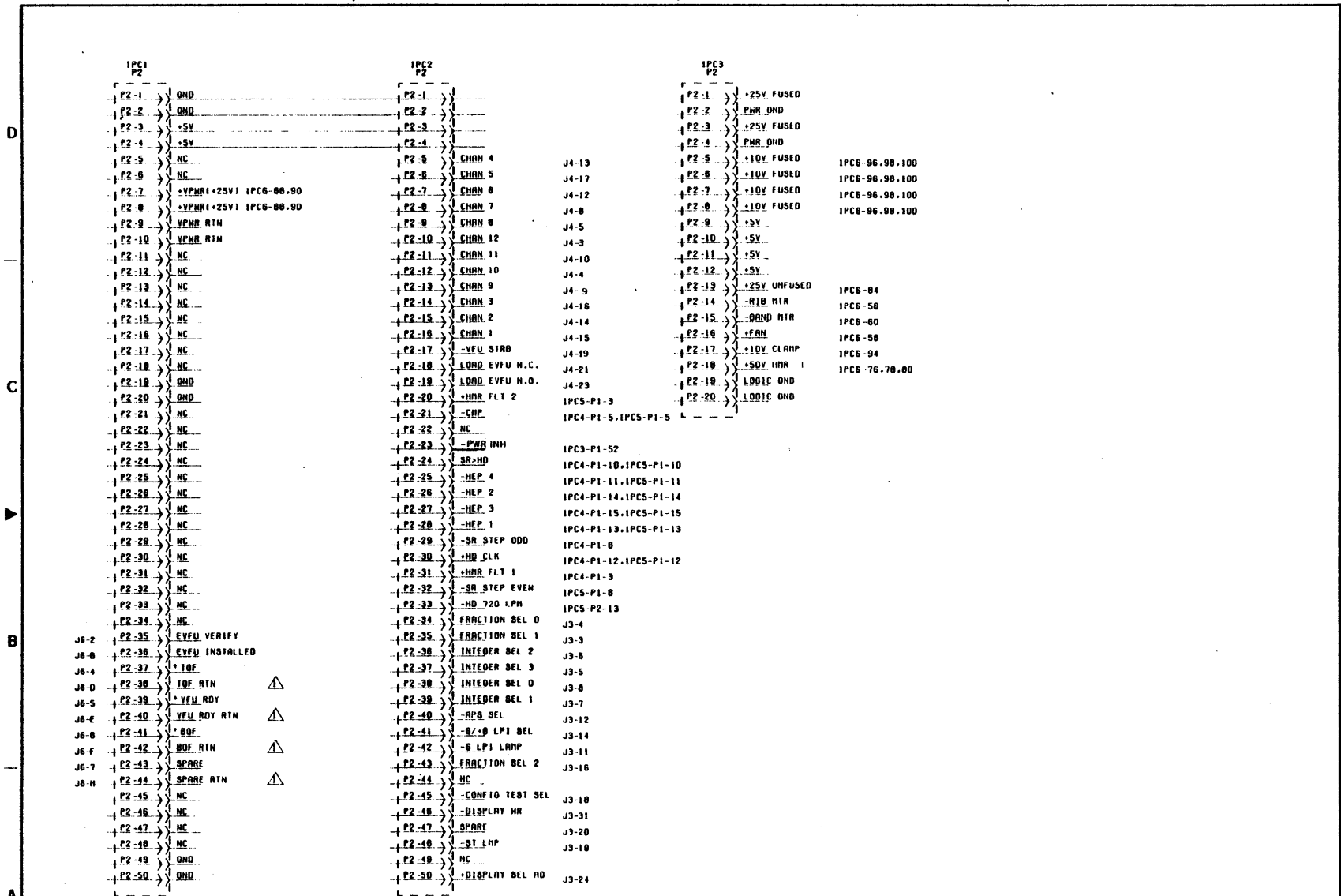
44682272

A

A
LOC 18P1
CROSS
REF NO 0101

▲ SIGNAL RETURNS ARE TIED COMMON AT J6 AND BUSSED TO IPC1-P1 AND IPC1-P2

360X BACKPLANE INTERCONNECTION P1		CODE IDENT	C	DWG NO	44682272	REV	A
18P1	SHEET	18	CROSS REF NO	0101			



11-24

44682272

LOC 1BP1
CROSS REF NO 0103

▲ SIGNAL RETURNS ARE TIED TO COMMON AT J6 AND BUSSED TO IPC1-P1 AND IPC1-P2

360X BACKPLANE INTERCONNECTION P2		CODE IDENT C	DWG NO 44682272	REV A
1BP1	SHEET 20	CROSS REF NO 0103		

D

D

C

C

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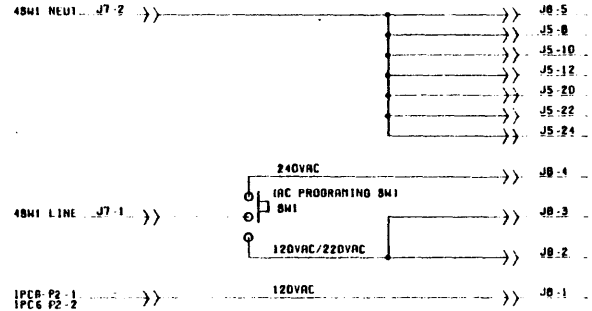
A

IPC1 P2		
P2-51	NC	
P2-52	FAULT	IPC2-P2-75
P2-53	NC	
P2-54	NC	
P2-55	NC	
P2-56	NC	
P2-57	NC	
P2-58	INTERFACE VERIFY RIN	J6-3
P2-59	INTERFACE VERIFY	J6-C
P2-60	NC	
P2-61	NC	
P2-62	NC	
P2-63	NC	
P2-64	NC	
P2-65	NC	
P2-66	NC	
P2-67	NC	
P2-68	NC	
P2-69	QND	
P2-70	QND	
P2-71	NC	
P2-72	NC	
P2-73	NC	
P2-74	-LED7 C.P.	J2-10
P2-75	NC	
P2-76	-LED8 C.P.	J2-12
P2-77	NC	
P2-78	SM8 S.P.	J2-1
P2-79	NC	
P2-80	BPANE	J2-2
P2-81	NC	
P2-82	SM9 C.P.	J2-3
P2-83	NC	
P2-84	DIP SM25 C.P.	J2-4
P2-85	NC	
P2-86	SM10 C.P.	J2-5
P2-87	NC	
P2-88	DIP SM26 C.P.	J2-6
P2-89	NC	
P2-90	SM7 C.P.	J2-7
P2-91	NC	
P2-92	DIP SM27 C.P.	J2-8
P2-93	NC	
P2-94	-LED10 C.P.	J2-16
P2-95	NC	
P2-96	-LED1 C.P.	J2-15
P2-97	-LED2 C.P.	J2-18
P2-98	-LED3 C.P.	J2-17
P2-99	QND	
P2-100	QND	

IPC2 P2		
P2-51	DISPLAY SEL R1	J3-23
P2-52	DISPLAY BIT 2	J3-26
P2-53	DISPLAY BIT 1	J3-25
P2-54	DISPLAY BIT 0	J3-28
P2-55	DISPLAY BIT 3	J3-27
P2-56	DISPLAY BIT 4	J3-29
P2-57	NC	
P2-58	DISPLAY BIT 5	J3-30
P2-59	START/STOP SW	J3-13
P2-60	FAULT REBT	IPC3 P1 12-J3-33
P2-61	-SINGLE SPACE	J3-35
P2-62	-FORM FEED	J3-37
P2-63	-TEST PRINT	J3-29
P2-64	NC	
P2-65	NC	
P2-66	NC	
P2-67	QND	
P2-68	QND	
P2-69	QND	
P2-70	QND	
P2-71	CLK	IPC1-P1-48
P2-72	-RESET OUT	IPC3-P1-18
P2-73	NC	
P2-74	NC	
P2-75	-FAULT	IPC1-P1-52
P2-76	NC	
P2-77	-RT LMP	IPC1-P1-3
P2-78	NC	
P2-79	-START SW	IPC1-P1-31
P2-80	NC	
P2-81	+BOF	IPC1-P1-50
P2-82	NC	
P2-83	-CPLS	IPC1-P1-37
P2-84	NC	
P2-85	HORZ RDR	J11-5
P2-86	DDP RDR QND	J11-10
P2-87	+CHAR 1	IPC1-P1-48
P2-88	NC	
P2-89	+CEDAT	IPC1-P1-35
P2-90	NC	
P2-91	-PH1DX	IPC1-P1-51
P2-92	NC	
P2-93	-GATE OPEN	IPC3-P1-23
P2-94	NC	
P2-95	-FUSE FLT	IPC3-P1-15, IPC4 P1-4, IPC5-P1-4
P2-96	NC	
P2-97	NC	
P2-98	NC	
P2-99	NC	
P2-100	NC	

IPC4 P2		
P2-1	PMR QND	
P2-2	PMR QND	
P2-3	PMR QND	
P2-4	PMR QND	
P2-5	PMR QND	
P2-6	PMR QND	
P2-7	50V FUSED 360	IPC6-76,78,80
P2-8	50V FUSED 360	IPC6-76,78,80
P2-9	50V FUSED 360	IPC6-76,78,80
P2-10	50V FUSED 360	IPC6-76,78,80
P2-11	50V FUSED 360	IPC6-76,78,80
P2-12	50V FUSED 360	IPC6-76,78,80
P2-13	CARD PRESENT	
P2-14	QND	
P2-15	+25V UNFUSED	
P2-16	36V REG 1MH	
P2-17	LOGIC QND	
P2-18	LOGIC QND	
P2-19	+5V	
P2-20	+5V	

IPC5 P2		
P2-1		
P2-2		
P2-3		
P2-4		
P2-5		
P2-6		
P2-7	50V FUSED 720	IPC6 68,70,72
P2-8	50V FUSED 720	IPC6 68,70,72
P2-9	50V FUSED 720	IPC6 68,70,72
P2-10	50V FUSED 720	IPC6 68,70,72
P2-11	50V FUSED 720	IPC6 68,70,72
P2-12	50V FUSED 720	IPC6 68,70,72
P2-13	HD 720 LPM	IPC2-P2-33
P2-14		
P2-15		IPC6 84
P2-16		IPC3-P1-39
P2-17		
P2-18		
P2-19		
P2-20		



11-25

1-46822-2

LOC 18P1
 CROSS
 REF NO. 0104

360X BACKPLANE INTERCONNECTION P2		CODE 18M1	DWG NO C 44682272	REV A
18P1	SHEET 21	CROSS REF NO 0104		

D

D

C

C

B

B

A

A

11-26

44682272

IPC6		
P2-1	ACC 120 VAC	J8-1
P2-2	ACC 120 VAC	J8-1
P2-3	NC	
P2-4	NC	
P2-5	NC	
P2-6	NC	
P2-7	RIB NTR AC SM	J5-18
P2-8	RIB NTR AC SM	J5-18
P2-9	NC	
P2-10	NC	
P2-11	NC	
P2-12	NC	
P2-13	BRND NTR AC SM	J5-4
P2-14	BRND NTR AC SM	J5-4
P2-15	NC	
P2-16	NC	
P2-17	NC	
P2-18	NC	
P2-19	ACC 120 VAC	J5-14
P2-20	ACC 120 VAC	J5-14
P2-21	NC	
P2-22	NC	
P2-23	NC	
P2-24	NC	
P2-25	FAN 10 AC SM	J5-2
P2-26	FAN 10 AC SM	J5-2
P2-27	NC	
P2-28	NC	
P2-29	NC	
P2-30	NC	
P2-31	NC	
P2-32	NC	
P2-33	NC	
P2-34	NC	
P2-35	NC	
P2-36	NC	
P2-37	NC	
P2-38	NC	
P2-39	10VAC	J9-1
P2-40	10VAC	J9-1
P2-41	10VAC	J9-1
P2-42	10VAC	J9-1
P2-43	10VAC	J9-2
P2-44	10VAC	J9-2
P2-45	10VAC	J9-2
P2-46	10VAC	J9-2
P2-47	25VAC	J9-3
P2-48	25VAC	J9-3
P2-49	25VAC	J9-4
P2-50	25VAC	J9-4

IPC6		
P2-51	QND	J9-5.0
P2-52	QND	J9-5.0
P2-53	QND	J9-5.0
P2-54	QND	J9-5.0
P2-55	SOVAC	J9-6
P2-56	RIB NTR	IPC3-P2-14
P2-57	SOVAC	J9-6
P2-58	FEAH	IPC3-P2-18
P2-59	SOVAC	J9-6
P2-60	BRND NTR	IPC3-P2-15
P2-61	SOVAC	J9-7
P2-62	NC	
P2-63	SOVAC	J9-7
P2-64	NC	
P2-65	SOVAC	J9-7
P2-66	NC	
P2-67	QND	J9-5.0
P2-68	SOV FUSED 720	IPC5-P2-7.0.9.10.11.12
P2-69	QND	J9-5.0
P2-70	SOV FUSED 720	IPC5-P2-7.0.9.10.11.12
P2-71	QND	J9-5.0
P2-72	SOV FUSED 720	IPC5-P2-7.0.9.10.11.12
P2-73	QND	J9-5.0
P2-74	NC	
P2-75	QND	J9-5.0
P2-76	SOV FUSED 360	IPC4-P2-7.0.9.10.11.12
P2-77	QND	J9-5.0
P2-78	SOV FUSED 360	IPC4-P2-7.0.9.10.11.12
P2-79	QND	J9-5.0
P2-80	SOV FUSED 360	IPC4-P2-7.0.9.10.11.12
P2-81	QND	
P2-82	NC	
P2-83	QND	J9-5.0
P2-84	+25V FUSED	IPC3-P2-13,IPC4-P2-15,IPC5-P2-15
P2-85	QND	J9-5.0
P2-86	NC	
P2-87	QND	J9-5.0
P2-88	+25V FUSED	IPC2-P1-7.0,IPC3-P2-1.3,J1-17
P2-89	QND	J9-5.0
P2-90	+25V FUSED	IPC2-P1-7.0,IPC3-P2-1.3,J1-17
P2-91	QND	J9-5.0
P2-92	NC	
P2-93	QND	J9-5.0
P2-94	10V CLAMP	IPC3-P2-17,J10-1
P2-95	QND	J9-5.0
P2-96	10V FUSED	IPC3-P2-5.6.7.0
P2-97	QND	J9-5.0
P2-98	10V FUSED	IPC3-P2-5.6.7.0
P2-99	QND	J9-5.0
P2-100	10V FUSED	IPC3-P2-5.6.7.0

CROSS
REF NO. 0105
LOC. 19P1

360X BACKPLANE
INTERCONNECTION
INPUT POWER BD. IPC6

CODE IDENT	DWG NO	REV
	C 44682272	A
19P1	SHEET 22	CROSS REF NO 0105

BACKPLANE

1BP1
 J4-1
 J4-2
 IPC2-P2-10 J4-3 CHAN 12
 IPC2-P2-12 J4-4 CHAN 10
 IPC2-P2-9 J4-5 CHAN 8
 OND BUS J4-6 OND
 +5V BUS J4-7 +5V
 IPC2-P2-8 J4-8 CHAN 7
 IPC2-P2-13 J4-9 CHAN 9
 IPC2-P2-11 J4-10 CHAN 11
 +5V BUS J4-11 +5V
 IPC2-P2-7 J4-12 CHAN 6
 IPC2-P2-5 J4-13 CHAN 4
 IPC2-P2-15 J4-14 CHAN 2
 IPC2-P2-16 J4-15 CHAN 1
 IPC2-P2-14 J4-16 CHAN 3
 IPC2-P2-8 J4-17 CHAN 5
 OND BUS J4-18 OND
 IPC2-P2-17 J4-19 -VEFU STB
 J4-20
 IPC2-P2-18 J4-21 LOAD EVFU N.C.
 OND BUS J4-22 OND
 IPC2-P2-18 J4-23 LOAD EVFU N.O.
 IPC2-P1-70 J4-24 -VEFU NTR
 +5V BUS J4-25 +5V
 J4-26

J5-1
 IPC8-25,26 J5-2 FAN LO AC SW
 J5-3
 IPC8-13,14 J5-4 BAND NTR AC SW
 J5-5
 J8-1 J5-6 EVFU AC LINE
 J5-7
 J8-5 J5-8 FAN LO AC NEUT
 J5-9
 J8-5 J5-10 BAND NTR AC NEUT
 J5-11
 J8-5 J5-12 EVFU AC NEUT
 J5-13
 IPC8-19,20 J5-14
 J5-15
 IPC8-7,8 J5-16 RIB NTR AC SW
 J5-17
 J8-1 J5-18 SPARE 120VAC LINE
 J5-19
 J8-5 J5-20
 J5-21
 J8-5 J5-22 RIB NTR AC NEUT
 J5-23
 J8-5 J5-24 SPARE 120VAC NEUT

BACKPLANE

1BP1
 IPC8-94 J10-1 CLAMP PWR
 IPC3-P1-10 J10-2 CLAMP
 IPC3-P1-40 J10-3 NC
 IPC3-P1-42 J10-4 NC
 IPC3-P1-42 J10-5 NC
 IPC3-P1-38 J10-6 NC

1J01-1

J01-2 HPR BANK THERM
 IPC3-P1-05 J01-3 HPR BANK THERM
 IPC2-P1-17 J01-4 HPRZ RDR OND
 IPC2-P1-17 J01-5 HPRZ RDR OND
 IPC2-P2-05 J01-6 HPRZ RDR
 IPC3-P1-47 J01-7 HPRZ RDR P.U.
 IPC4-P1-16 J01-8 PHV RDR OND
 IPC3-P1-26 J01-9 PHV RDR P.U.
 IPC4-P1-2 J01-10 PHV RDR
 IPC2-P2-06 J01-11 ODP RDR OND
 IPC2-P1-36 J01-12 ODP RDR
 IPC3-P1-06 J01-13 ODP RDR P.U.

11-28

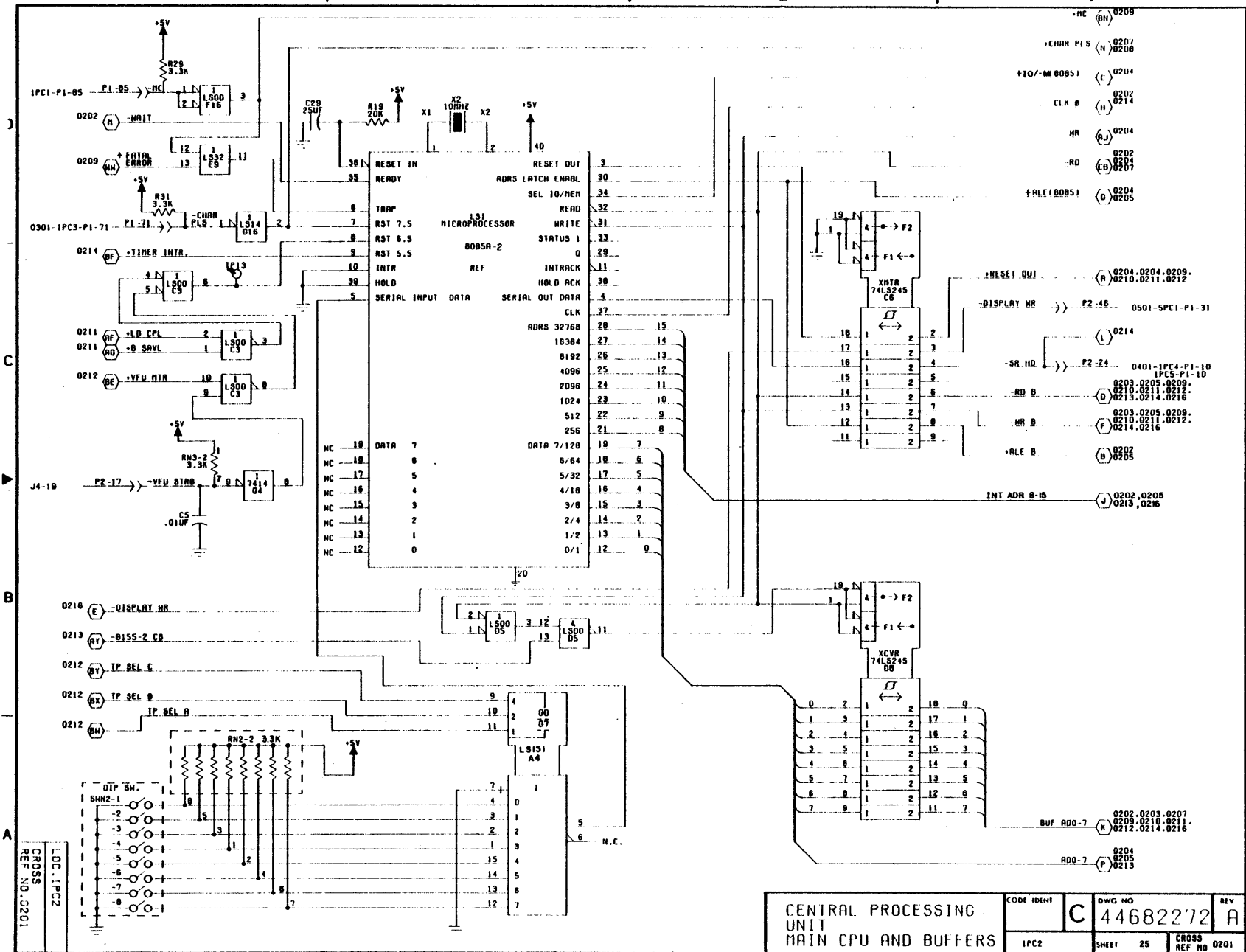
CROSS
 REF NO. 0107
 LOC. 1BP1

360X BACKPLANE OFF BOARD CONNECTIONS		CODE IDENT C	DWG NO 44682272	REV A
1BP1	SHEET 24	CROSS REF NO 0107		

44682272

B

A



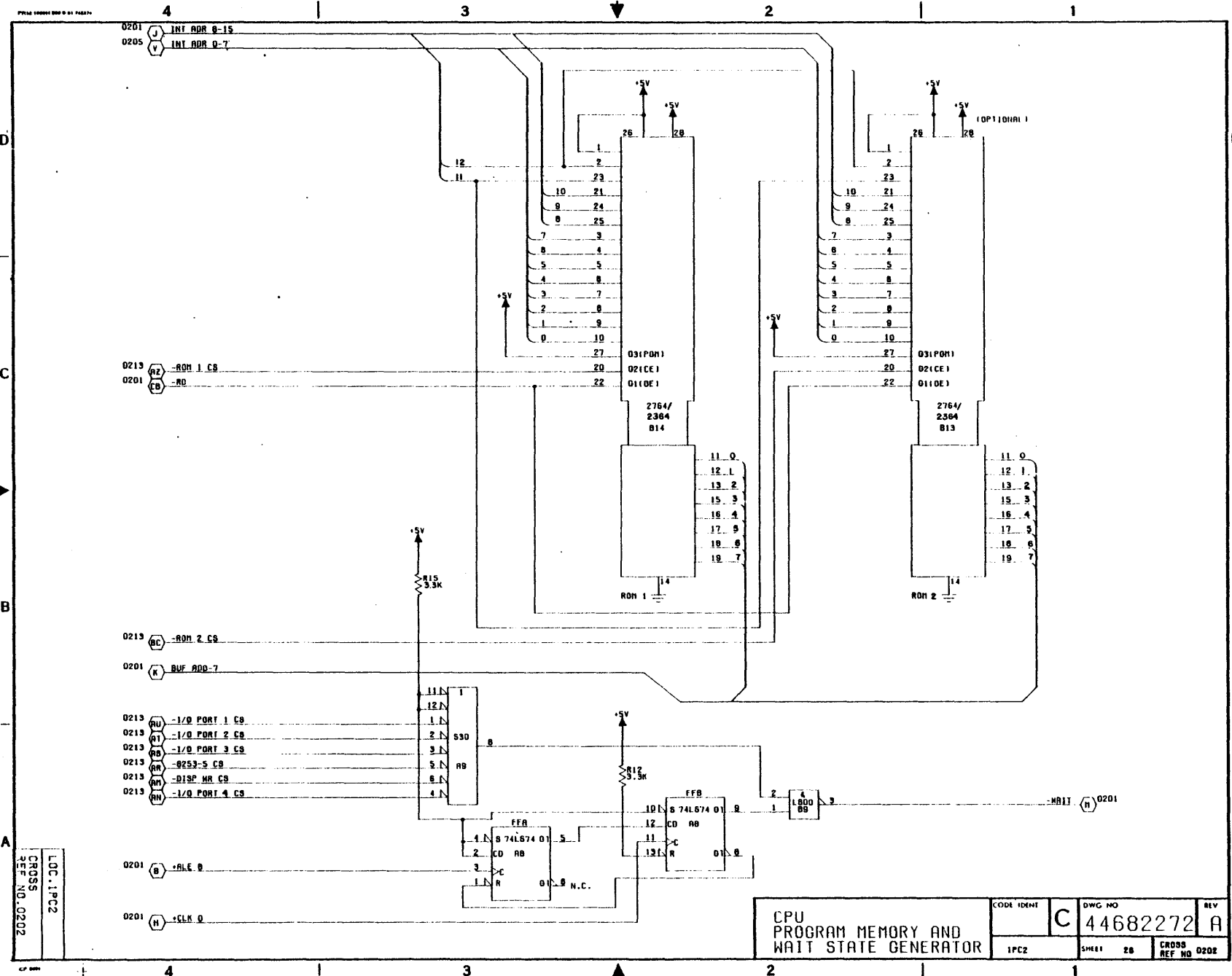
11-30

44682272

LOC. IPC2
CROSS
REF. NO. 0201

CENTRAL PROCESSING UNIT MAIN CPU AND BUFFERS		CODE IDENT	C	DWG NO	44682272	REV	A
IPC2	SHEET	25	CROSS REF NO	0201			

11-81



CROSS REF NO. 0202
LOC. 1PC2

4

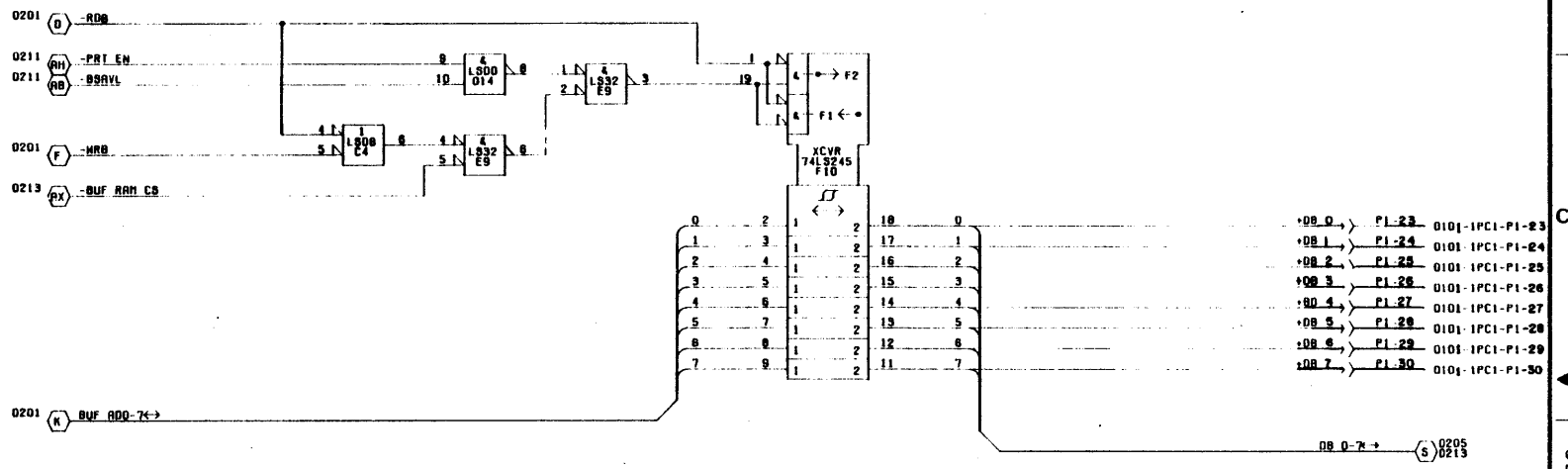
3

2

1

D

D



C

C

11-32

B

B

44682272

A

A

LOC. 1-IPC2
 CROSS REF. NO. 0203

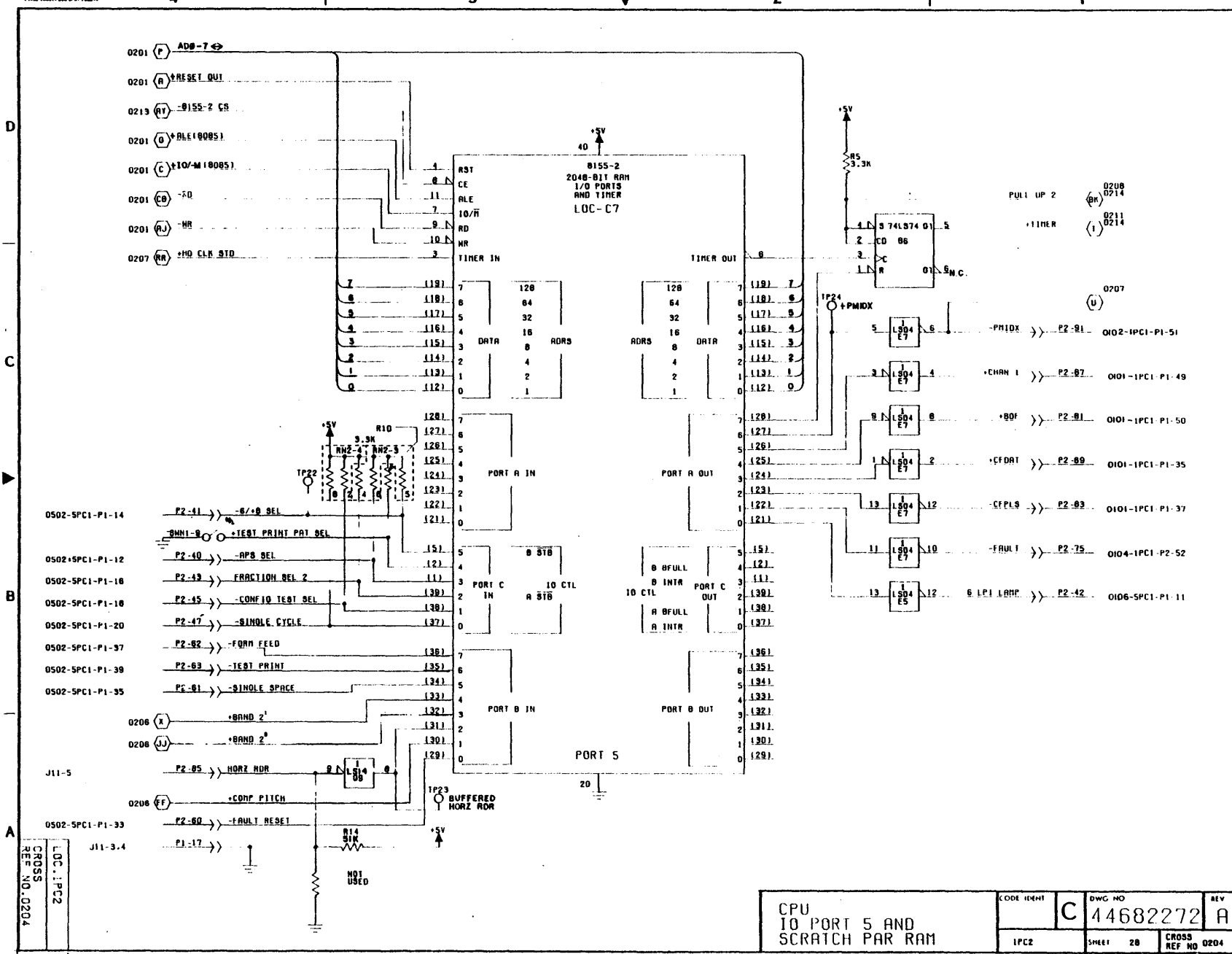
CPU DATA BUS BUFFER		CODE IDENT	DWG NO	REV
			C 44682272	A
IPC2	SHEET 27	CROSS REF. NO	0203	

4

3

2

1



11-33

D
C
B
A

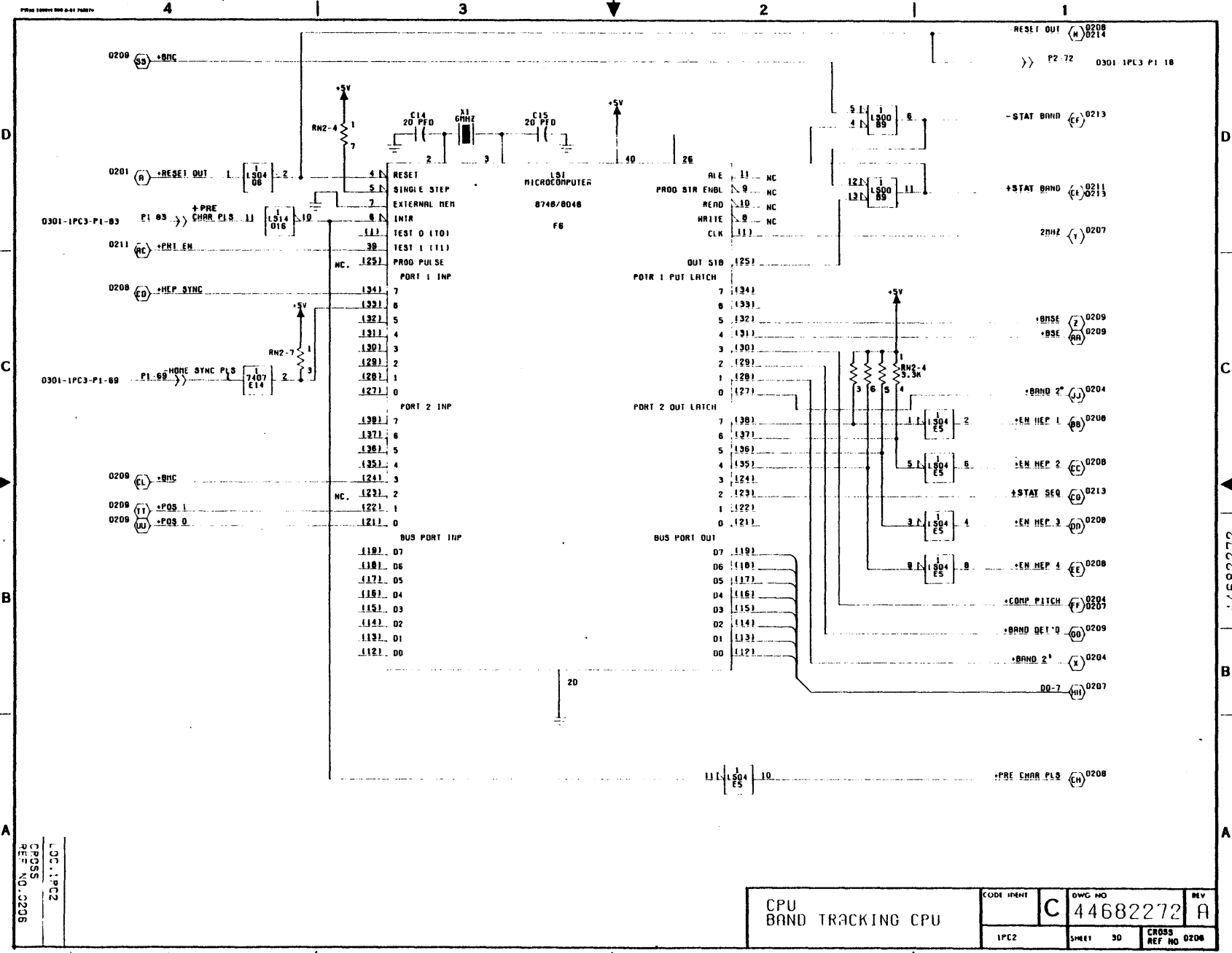
D
C
B
A

44682272

LOC: IPC2
 CROSS REF NO: 0204

CPU
 IO PORT 5 AND
 SCRATCH PAR RAM

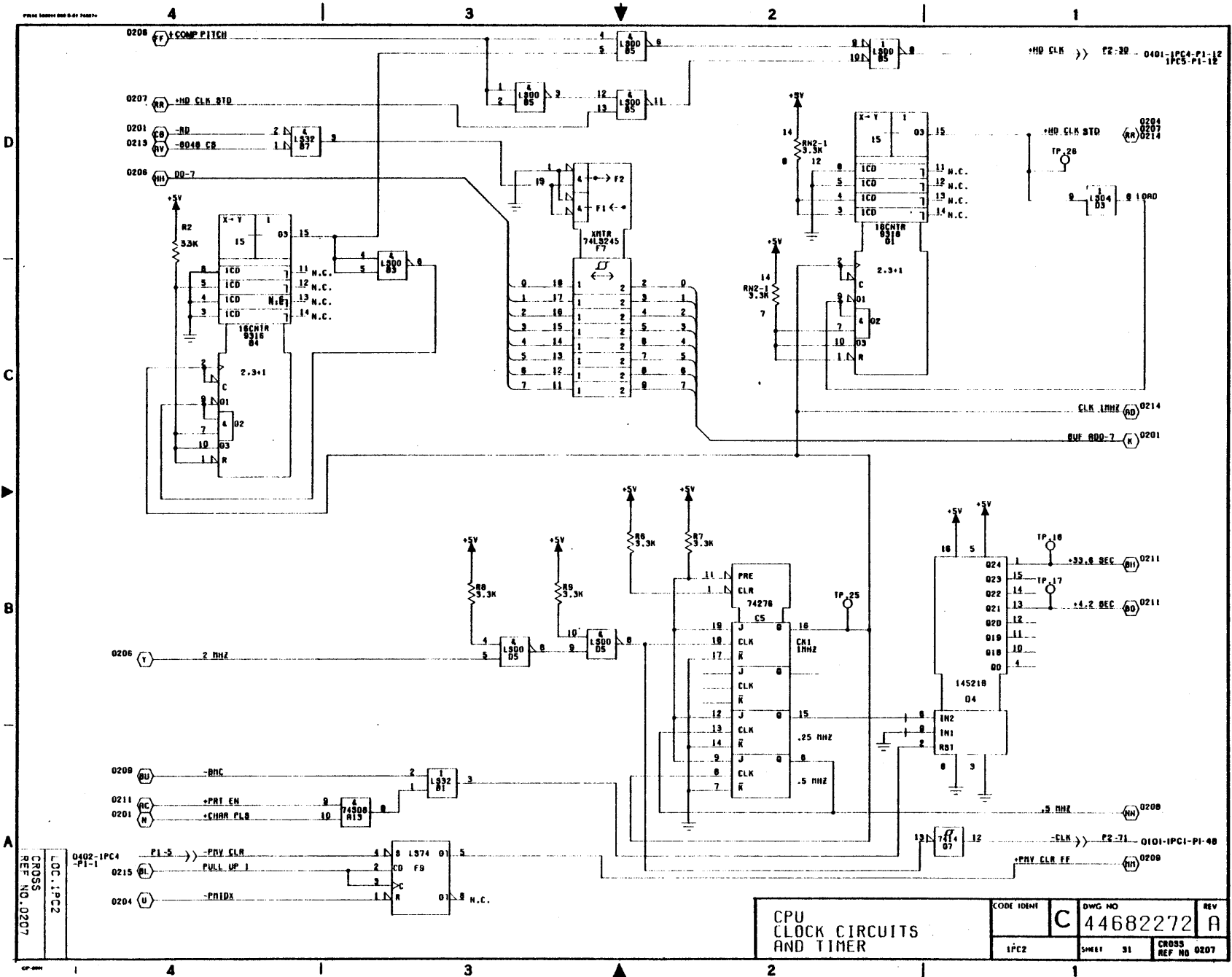
CODE 11441	DWG NO C	REV A
IPC2	SHEET 28	CROSS REF NO 0204



11-35

LCC:IPC2
 CROSS
 REF NO: 0208

CPU BAND TRACKING CPU		CODE INENT	DWG NO	REV
		C	44682272	A
IPC2	SHEET 30	CROSS REF NO 0208		



11-36

44682272

CPU
CLOCK CIRCUITS
AND TIMER

CODE IDENT	DWG NO	REV
C	44682272	A
IPC2	SHEET 31	CROSS REF NO 0207

CROSS
REF NO. 0207

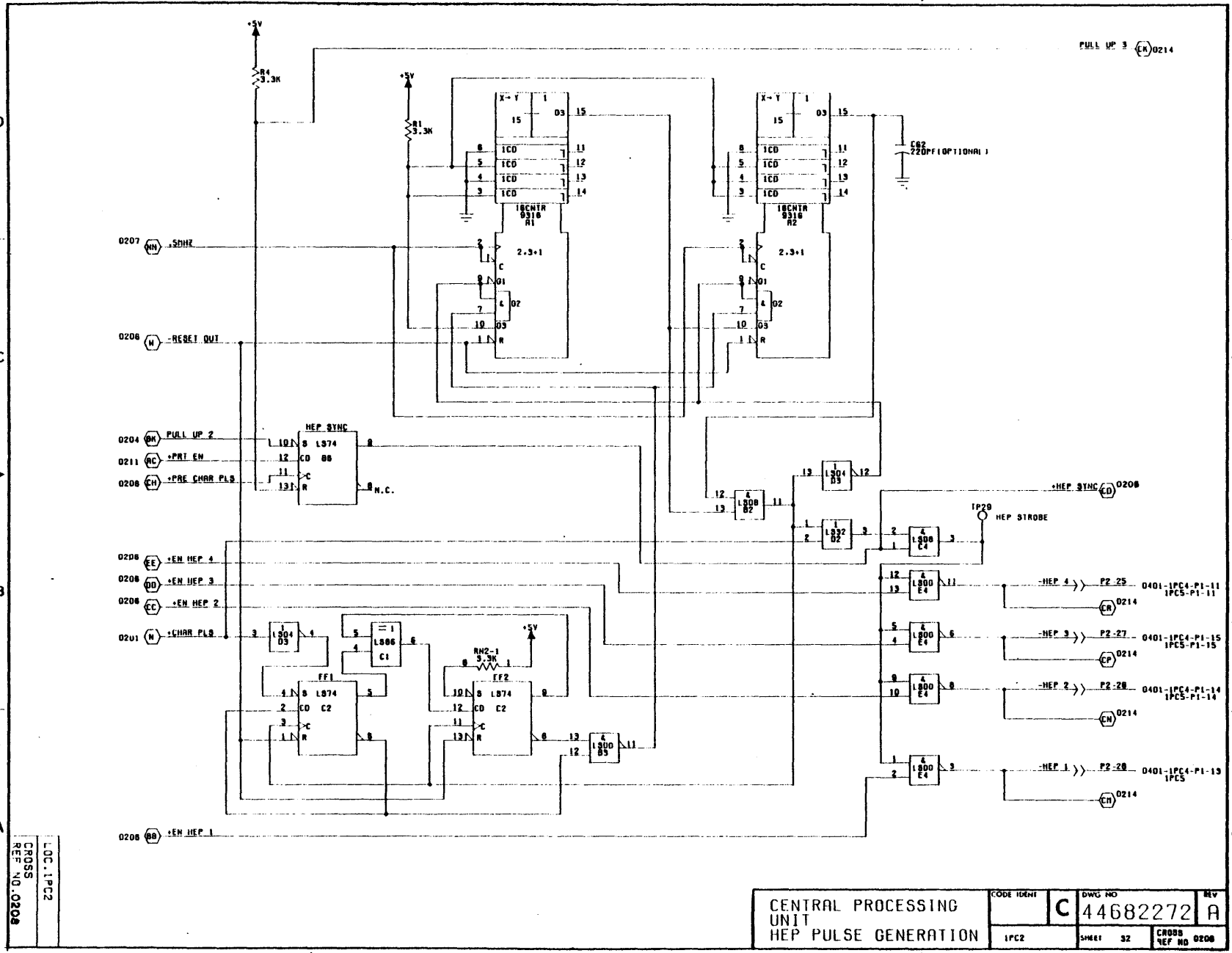
LOC. 1PC2

0402-IPC4 P1-5 → PNY CLR
 0215 (U) → PULL UP 1
 0204 (U) → PNYDA

0101-IPC1-P1-12
 0209 (H) → PNY CLR EF
 0208 (H) → .5 MHz
 0211 (H) → +32.8 SEC
 0211 (H) → +4.2 SEC

11-37

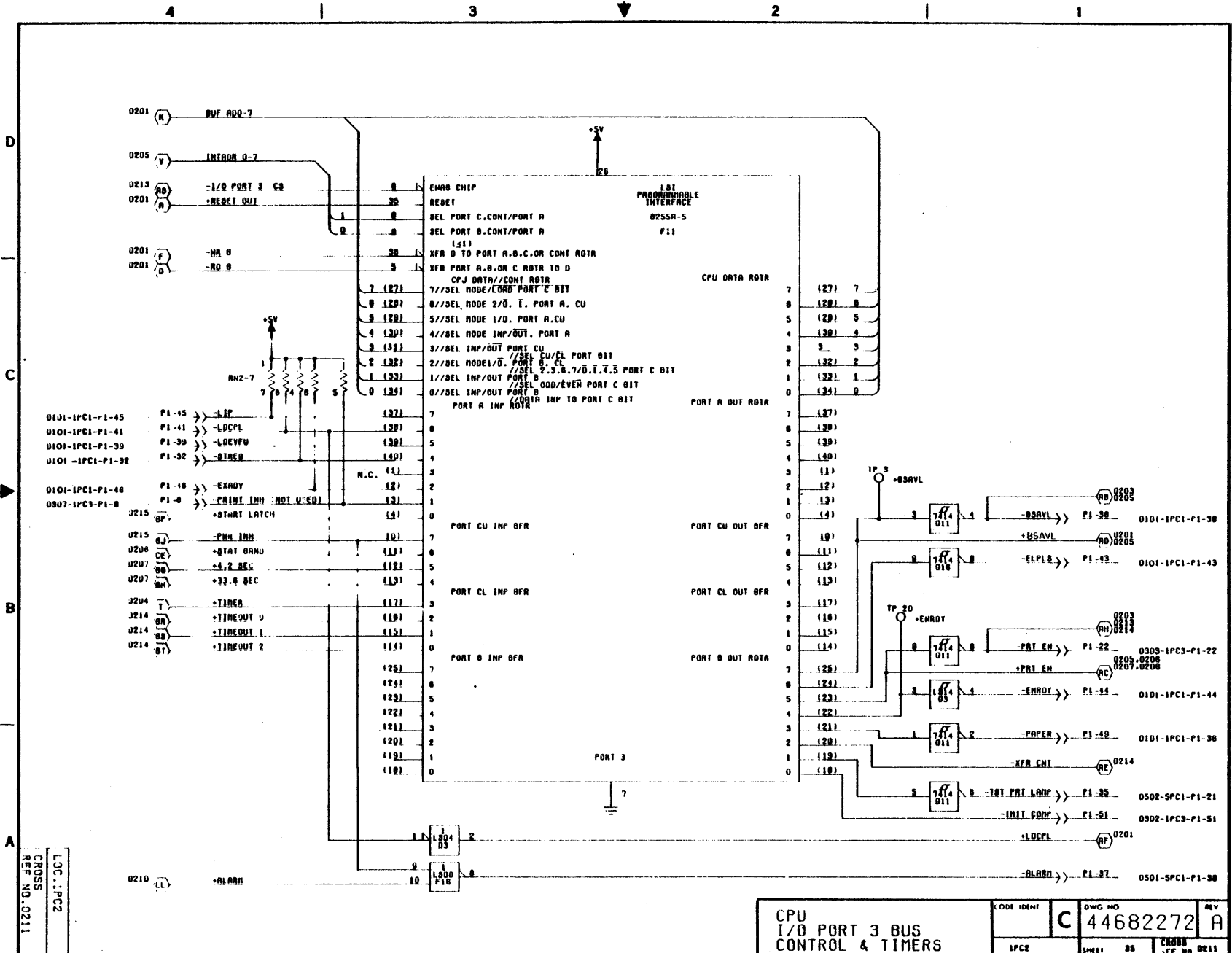
44682272



LOC. 1PC2
 CROSS
 REF. NO. 0208

CENTRAL PROCESSING UNIT HEP PULSE GENERATION		CODE IDENT C	DWG NO 44682272	REV A
IPC2	SHEET 32	CROSS REF NO 0208		

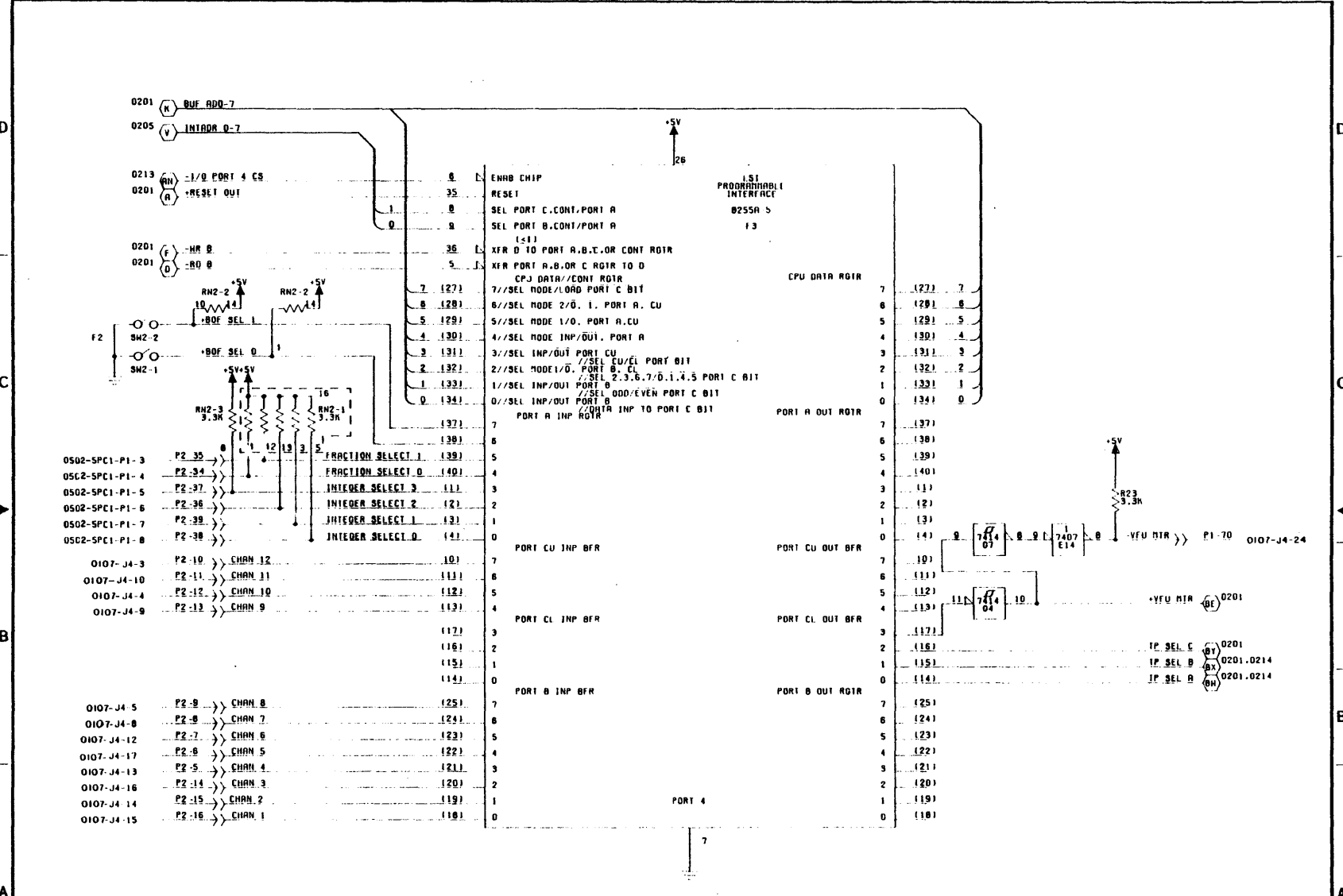
11-40



LOC. 1PC2
 CROSS
 REF. NO. 0211

CPU I/O PORT 3 BUS CONTROL & TIMERS		CODE IDENT	C	DWG NO	44682272	REV	A
IPC2	SMEL	35	CROSS REF NO	0211			

44682272

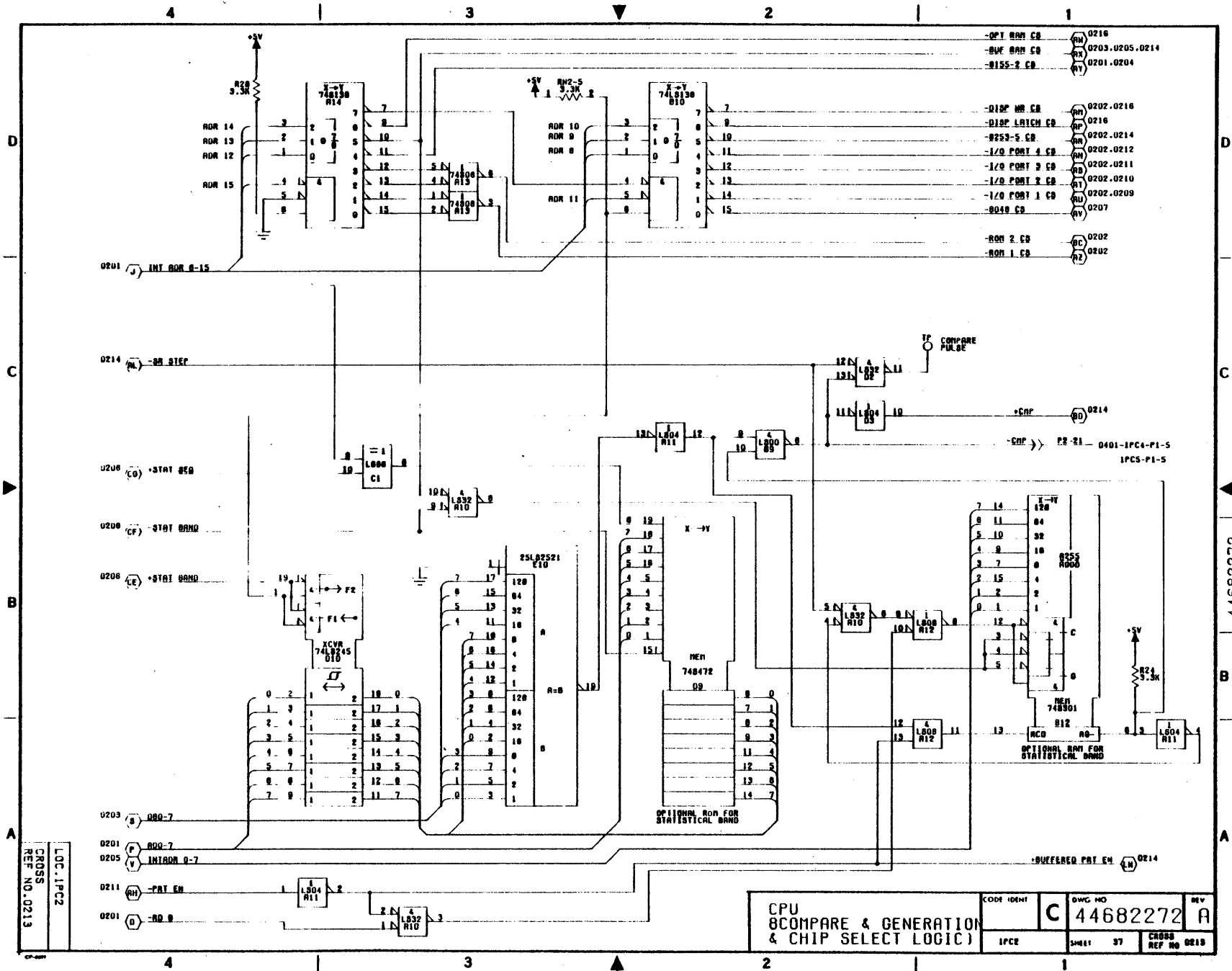


11-41

LOC: IPC2	CROSS REF NO: 0212
CHAN 2	BDF SEL 1 0 BDF SEL 0 0
CHAN 8	BDF SEL 1 0 BDF SEL 0 1
CHAN 12	BDF SEL 1 1 BDF SEL 0 0
NO BDF	BDF SEL 1 1 BDF SEL 0 1

CPU (*O PORT 4 [VFU CONTROL])	CODE IDENT	DWG NO	REV
	IPC2	C 44682272	A
SHEET 38		CROSS REF NO 0212	

11-42



LOC. 1PC2
 CROSS REF. NO. 0213

CPU
 8COMPARE & GENERATION
 & CHIP SELECT LOGIC

CODE IDENT	C	DWG NO	44682272	REV	A
IPCZ		SHEET	37	CROSS REF NO	0213

44682272

D

C

B

A

D

C

B

A

0204 (I) -TIMER
 0201 (H) -BUF ADD-7
 0205 (V) -INT ADD 0-7

0208 (CH) -PULL UP 3
 0204 (GR) -PULL UP 2

0207 (HD) -CLK 1 MHz
 0207 (RR) -HD CLK 310
 0210 (GR) -HMR TEST

0213 (RR) -0253-5 CS
 0201 (D) -RD B
 0201 (F) -WR B

0102-IPC3-P1-02 P1-02 -HMR IMPACT

0212 (GX) -TP REL B
 0212 (GH) -TP REL A

0208 (CH) -HEP 1
 0208 (CN) -HEP 2
 0208 (CP) -HEP 3
 0208 (CA) -HEP 4

0215 (GJ) -PHR INH

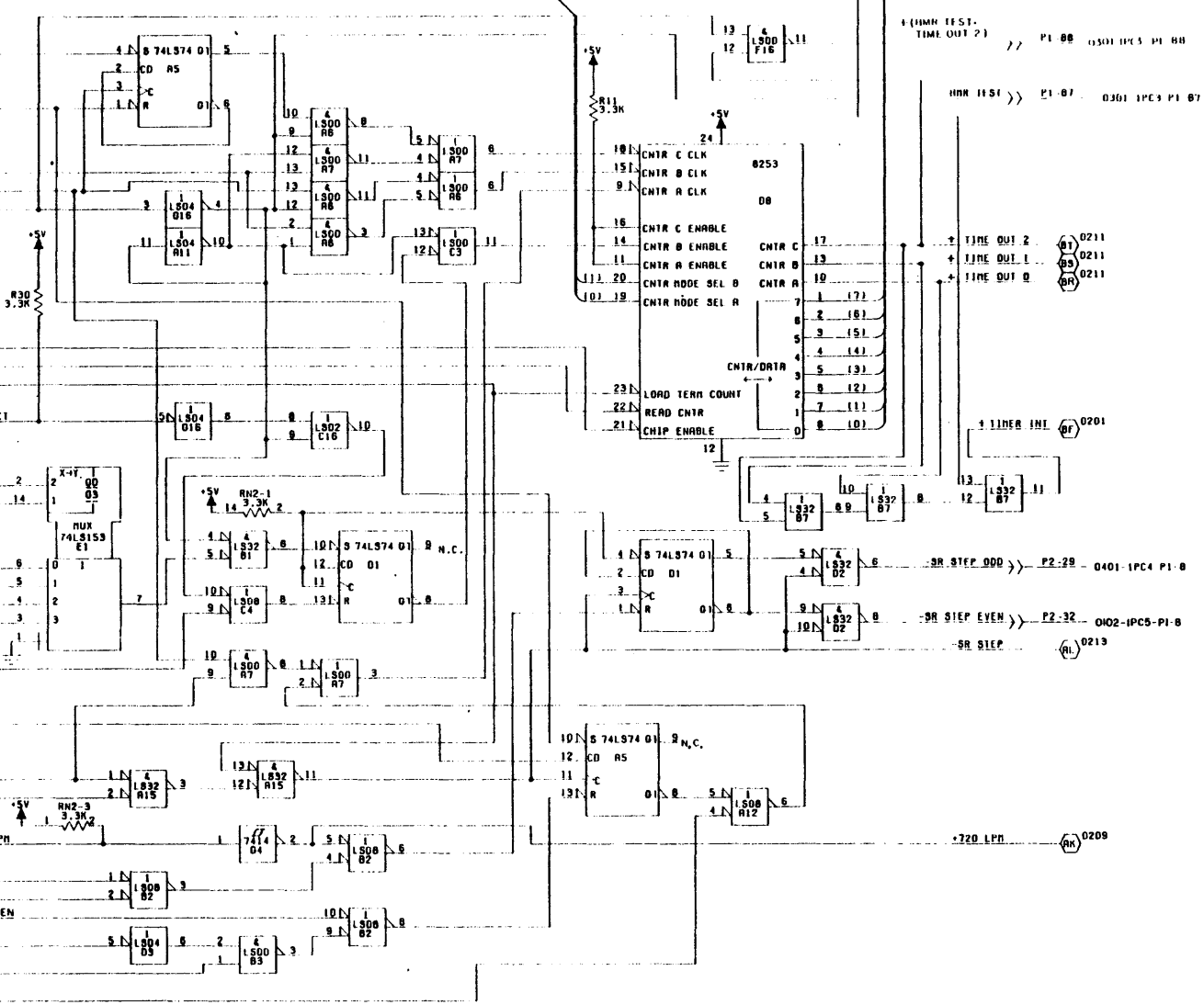
0213 (GD) -+CMP

0211 (RH) -PRI EN
 0213 (RX) -BUF RAM CS

0104-IPC5-P2-13 P2-33 -HD 720 LPH

0201 (L) -SR HD
 0208 (X) -RESET OUT
 0215 (LW) +BUFFED PRI EN

0201 (D) -RD B
 0201 (H) -CLK B
 0211 (RE) -XFR CNT



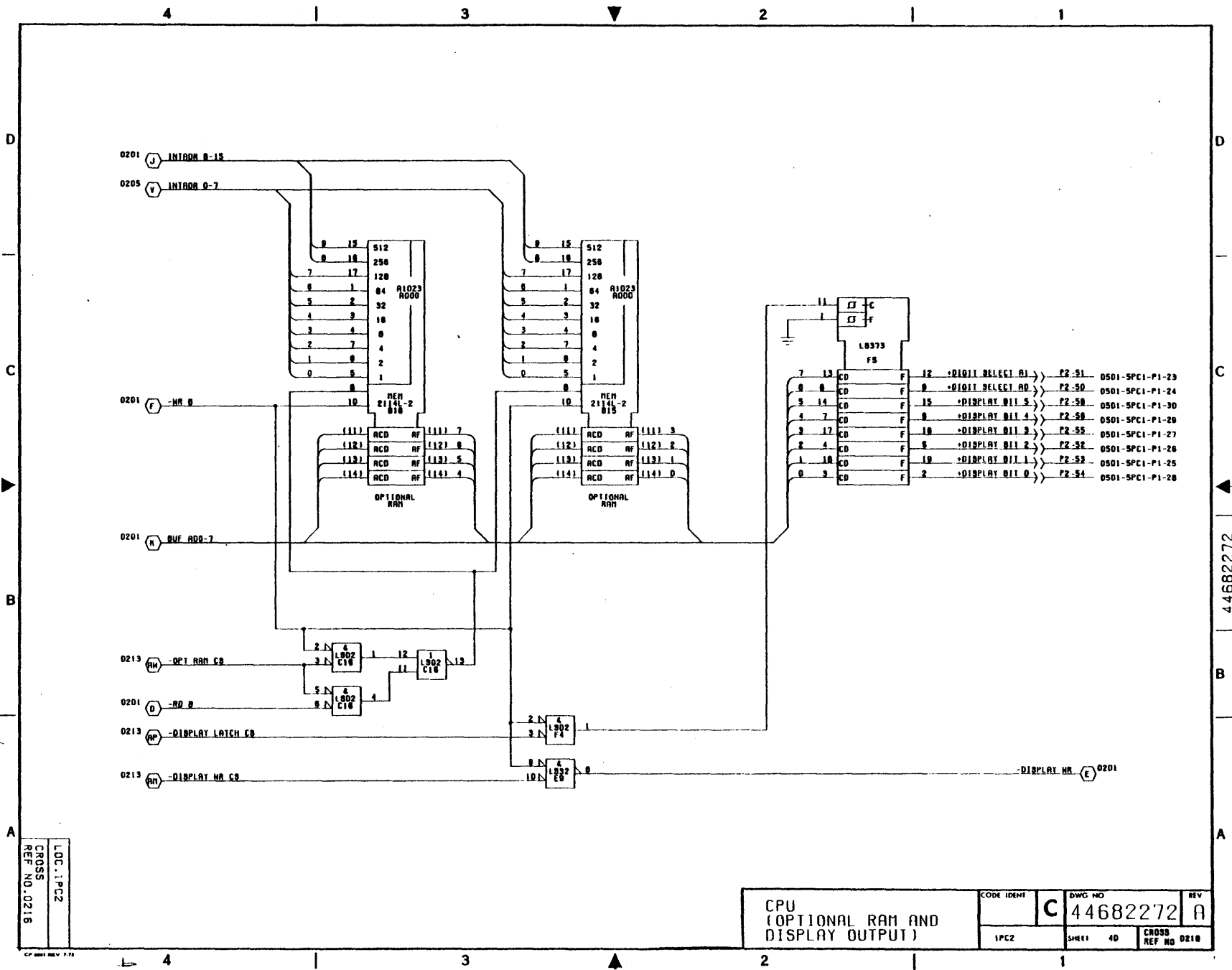
11-43

272709077

LOC 1PC2
 CROSS
 REF NO 0214

CPU (TIMER LOGIC)		CODE IDENT	DWG NO	REV
		C	44682272	A
IPC2	SHEET 38	CROSS REF NO 0214		

11-45/11-46

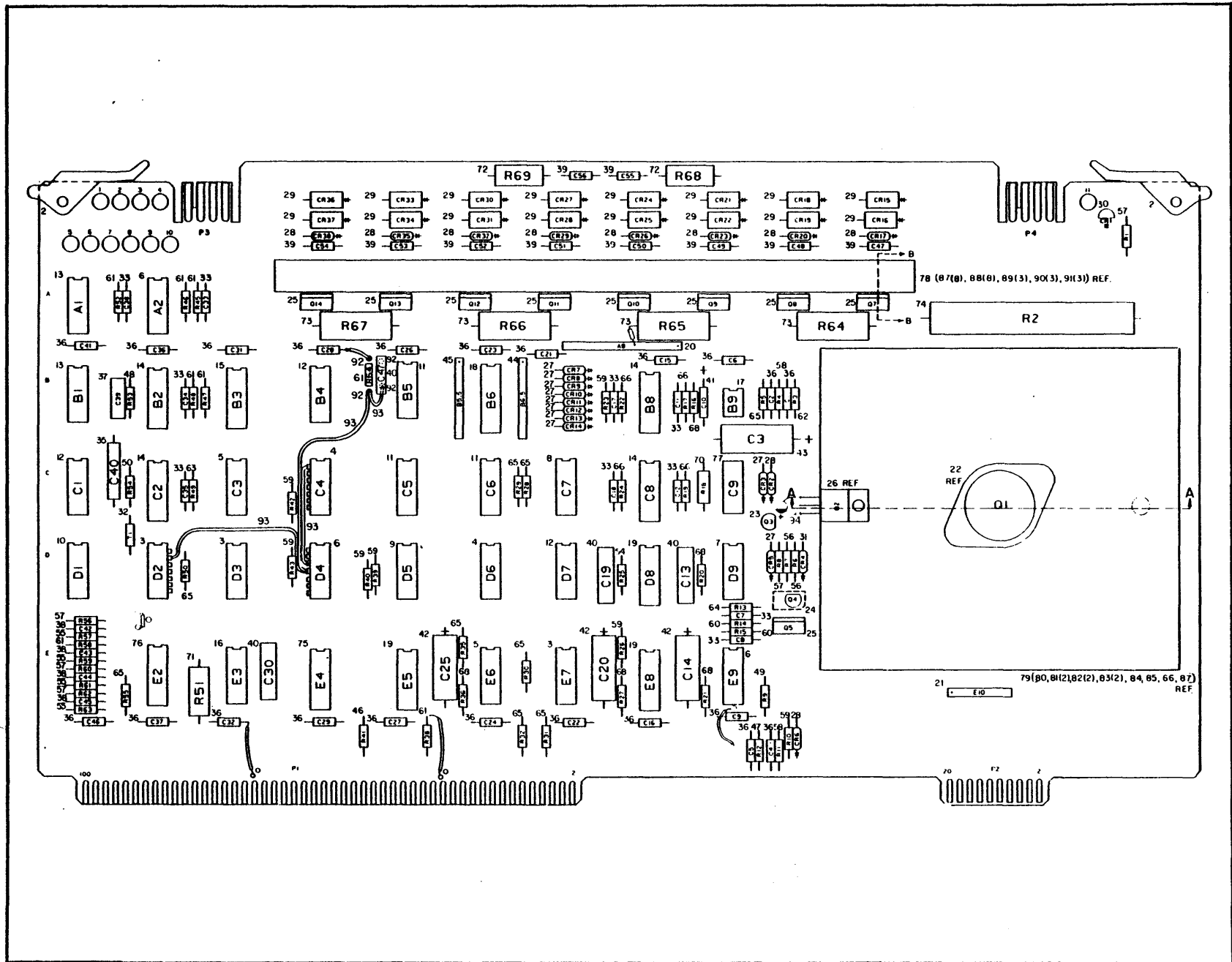


LOC: IPC2
 CROSS
 REF NO: 0218

CPU
 (OPTIONAL RAM AND
 DISPLAY OUTPUT)

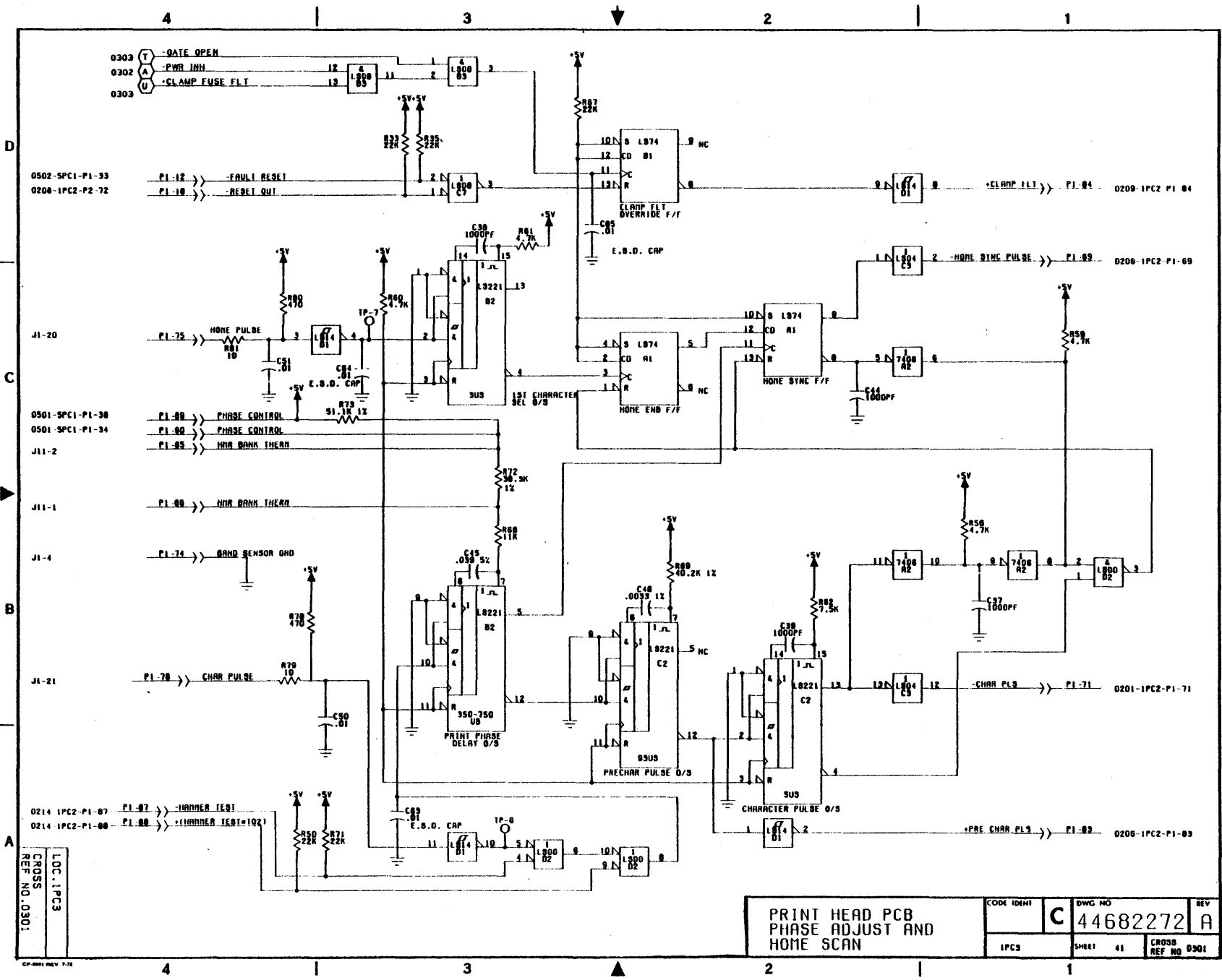
CODE IDENT	DWG NO	REV
IPC2	C 44682272	A
SHEET 40	CROSS REF NO 0218	

11-47



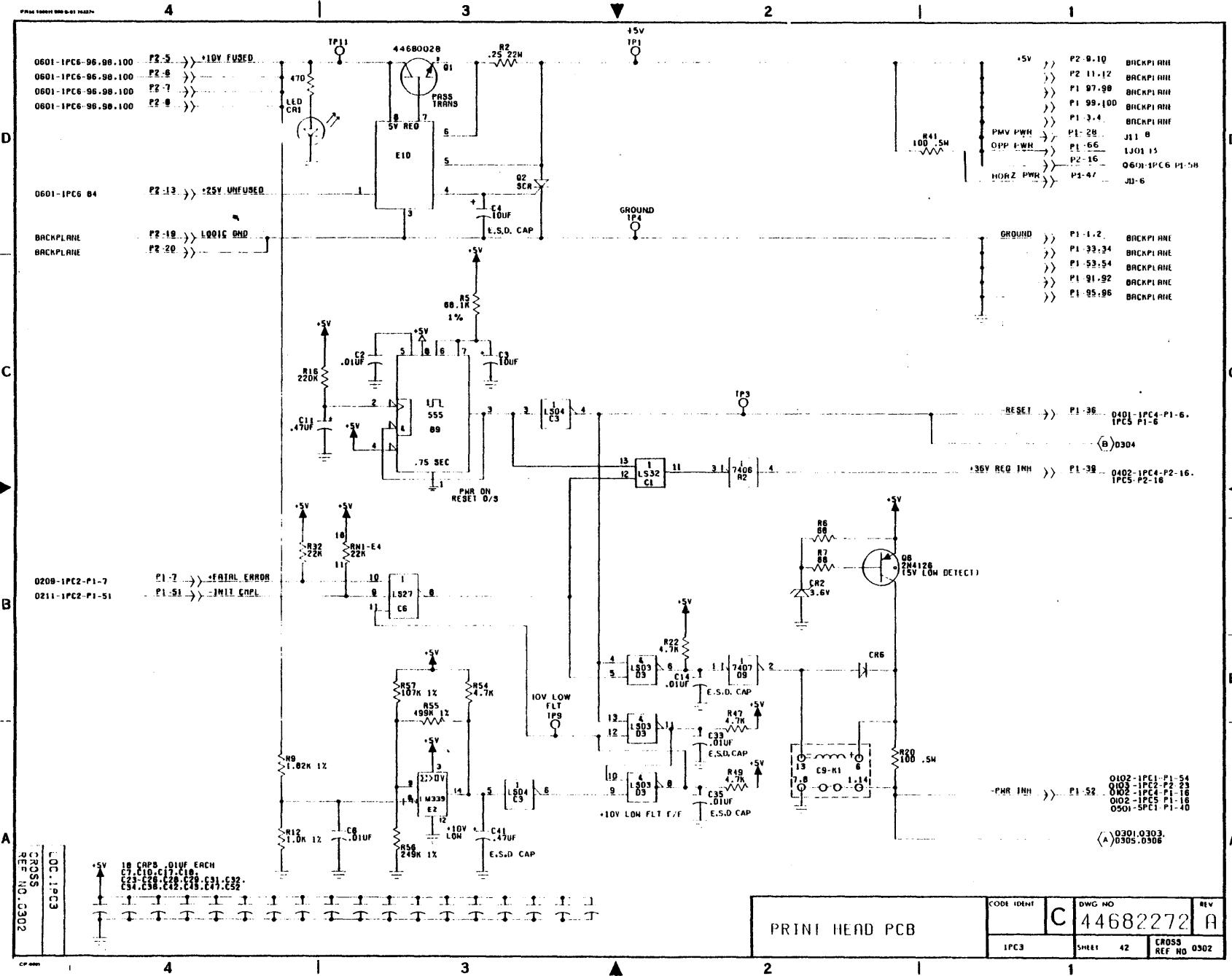
PRINT HEAD ELECTRONICS PCB ASSEMBLY

11-48



LOC. 1PC3
CROSS REF. NO. 0301

PRINT HEAD PCB PHASE ADJUST AND HOME SCAN		CODE IDENT	C	DWG NO	44682272	REV	A
IPC3	SHEET	41	CROSS REF NO	0301			



11-49

18 CAPS .01UF EACH
 C7, C10, C17, C18
 C23, C28, C38, C39
 C54, C58, C62, C63, C67, C68

LOC: IPC3
 CROSS
 REF NO: 0302

PRIN1 HEAD PCB		CODE IDENT	DWG NO	REV
		C	44682272	A
IPC3	SHEET 42	CROSS REF NO 0302		

- +5V >> P2-9-10 BACKPLANE
- >> P2-11-12 BACKPLANE
- >> P1-97-99 BACKPLANE
- >> P1-99-100 BACKPLANE
- >> P1-3-4 BACKPLANE
- >> P1-28 J11 B
- >> P1-66 LJ01 IS
- >> P2-16 Q601-IPC6 P1-58
- >> P1-47 J0-6

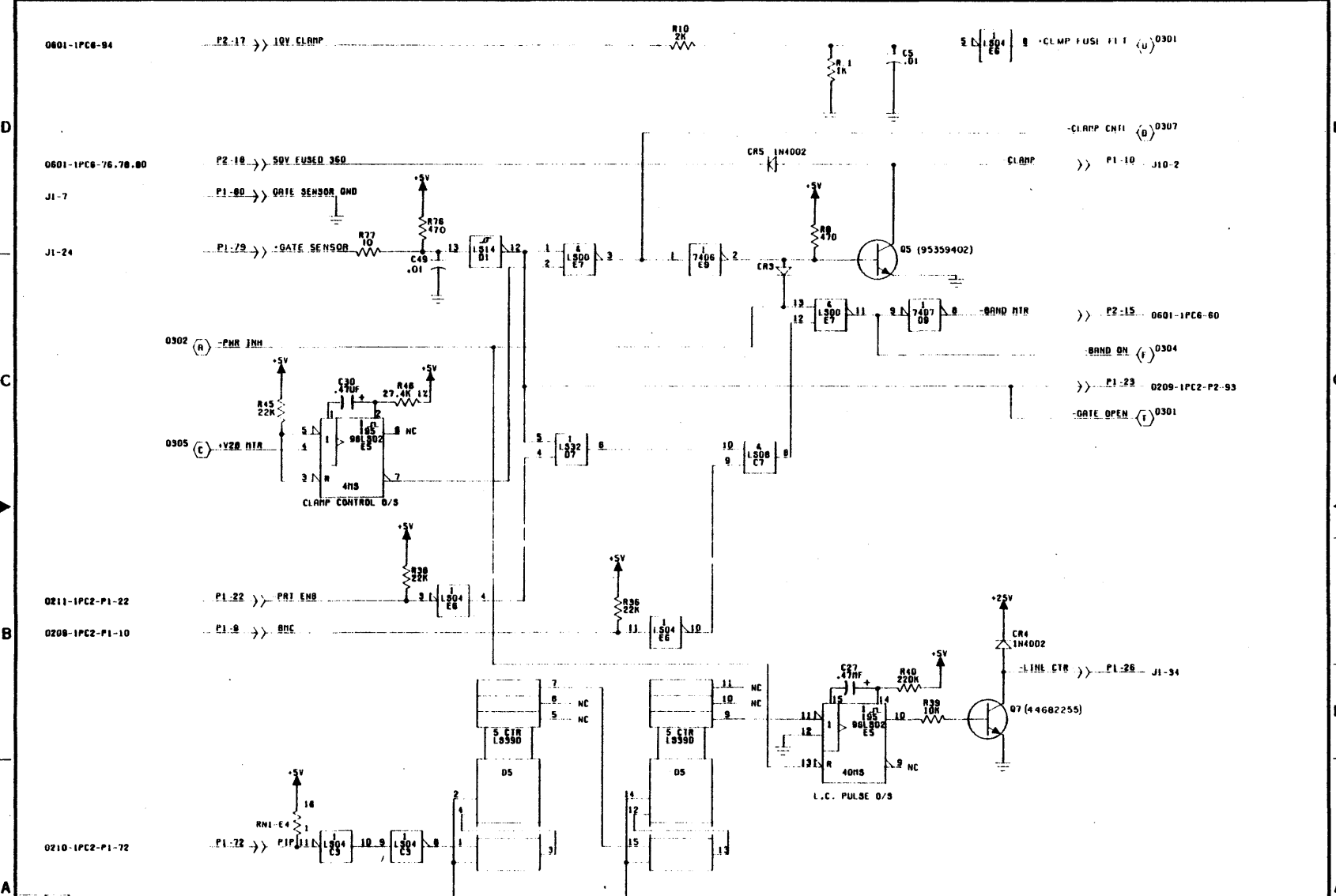
- GROUND >> P1-1-2 BACKPLANE
- >> P1-33-34 BACKPLANE
- >> P1-53-54 BACKPLANE
- >> P1-91-92 BACKPLANE
- >> P1-95-96 BACKPLANE

- RESET >> P1-36 0401-IPC4-P1-6, IPC5-P1-6
- >> (B)0304
- +36V REG INH >> P1-38 0402-IPC4-P2-16, IPC5-P2-16

- PHR INH >> P1-52
- 0102-IPC1-P1-54
- 0103-IPC2-P2-23
- 0102-IPC4-P1-18
- 0102-IPC5-P1-18
- 0501-SPC1-P1-10
- (A)0301,0303
- (A)0305,0306

11-50

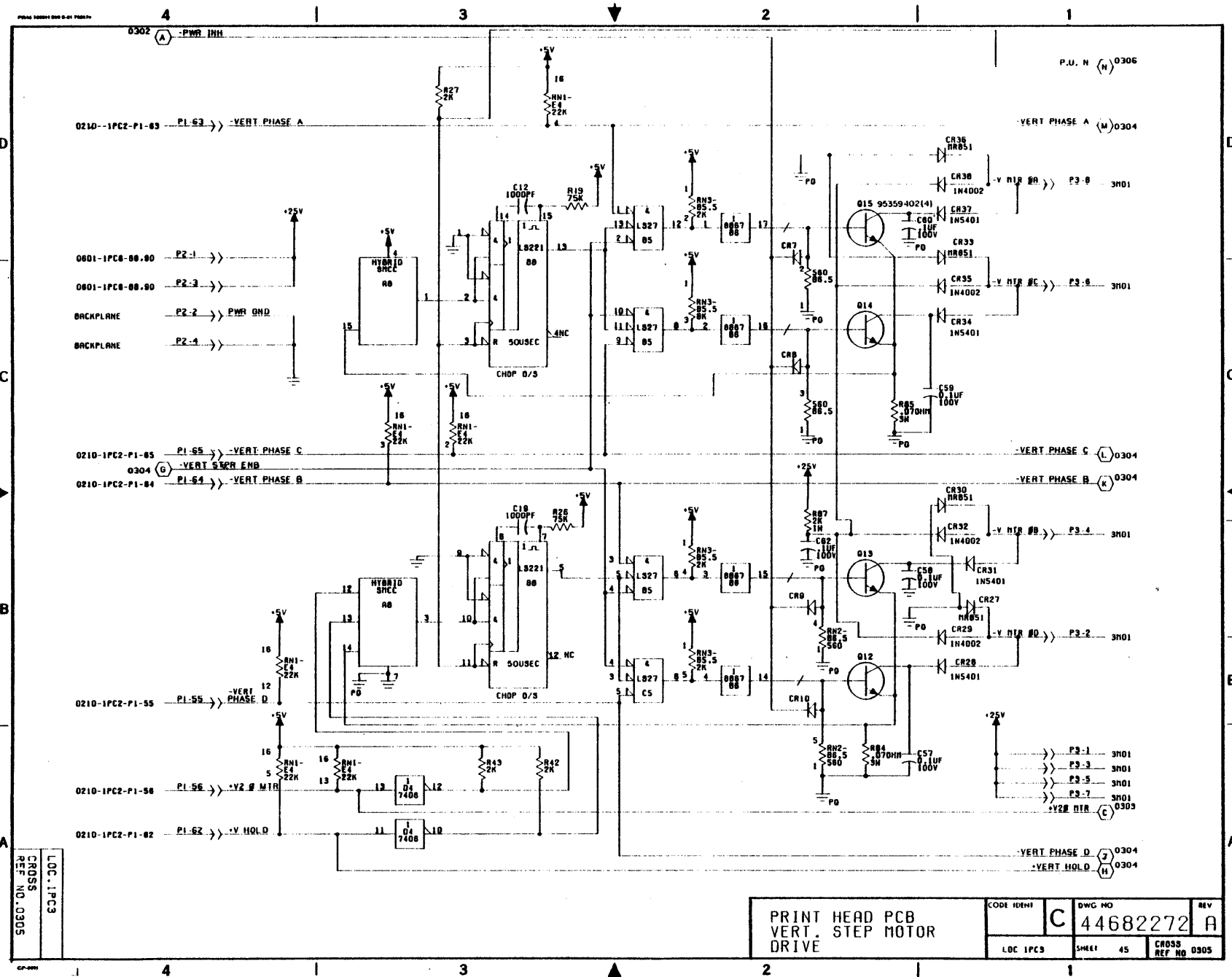
44682272



LOC. 1 PCB
 CROSS REF. NO. 0303

#100 LINE COUNTER

PRINT HEAD PCB		CODE IDENT	DWG NO	REV
		0010702	C 44682272	A
IPCS	SHEET 43	CROSS REF NO 0303		



P.U. N (N) 0306

0210-1PC2-P1-83 --P1-53 -- VERT PHASE A

VERT PHASE A (M) 0304

0801-1PC8-88-80 P2-1 -->

0801-1PC8-88-80 P2-3 -->

BACKPLANE P2-2 --> PWR GND

BACKPLANE P2-4 -->

0210-1PC2-P1-85 P1-55 --> VERT PHASE C

0304 (G) VERT 55CR ENB

0210-1PC2-P1-84 P1-54 --> VERT PHASE B

VERT PHASE C (L) 0304

VERT PHASE B (K) 0304

0210-1PC2-P1-55 P1-55 --> VERT PHASE D

VERT PHASE D (J) 0304

0210-1PC2-P1-58 P1-58 --> V2 # MTR

P3-1 3101

P3-3 3101

P3-5 3101

P3-7 3101

V2# MTR (C) 0303

0210-1PC2-P1-82 P1-62 --> V HOLD

VERT HOLD (H) 0304

LOC 1PC3

CROSS REF NO 0305

PRINT HEAD PCB

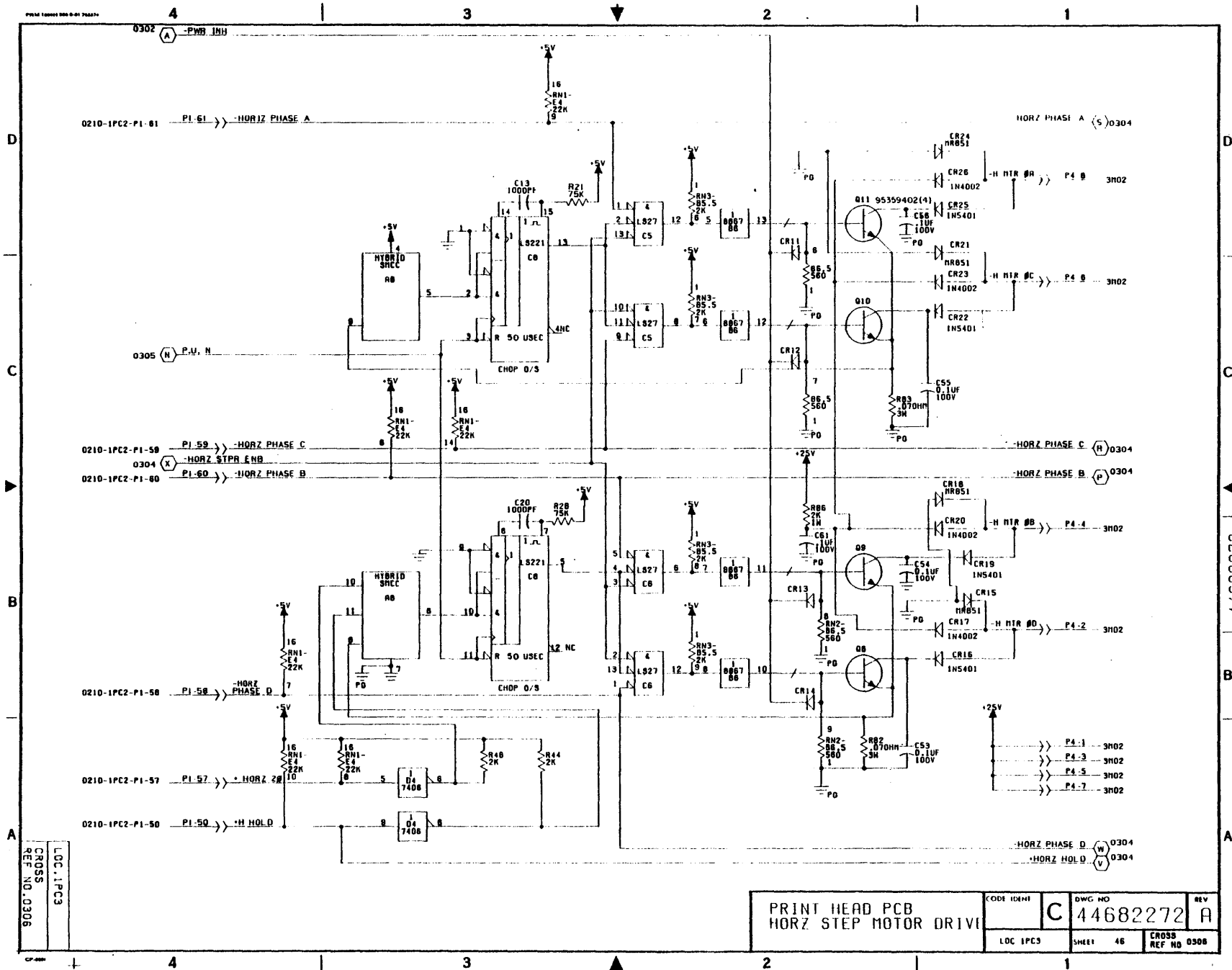
VERT. STEP MOTOR

DRIVE

CODE IDENT	C	DWG NO	44682272	REV	A
LOC 1PC3	SHEET	45	CROSS REF NO	0305	

11-52

44682272



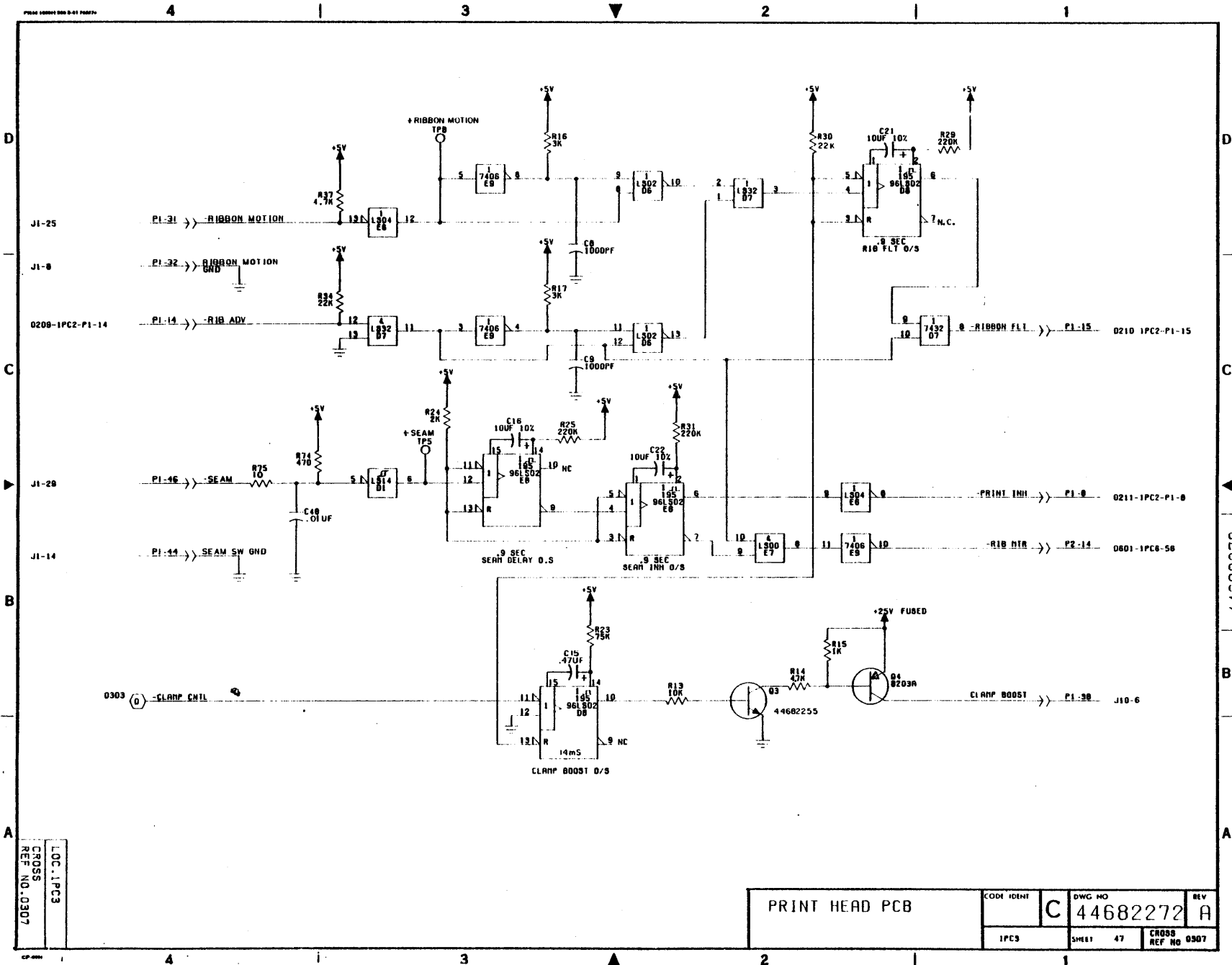
11-53

LOC. 1PC3
 CROSS REF. NO. 0306

PRINT HEAD PCB HORZ STEP MOTOR DRIVER		CODE 104N1	DWG NO C 44682272	REV A
LOC. 1PC3	SHEET 46	CROSS REF. NO. 0306		

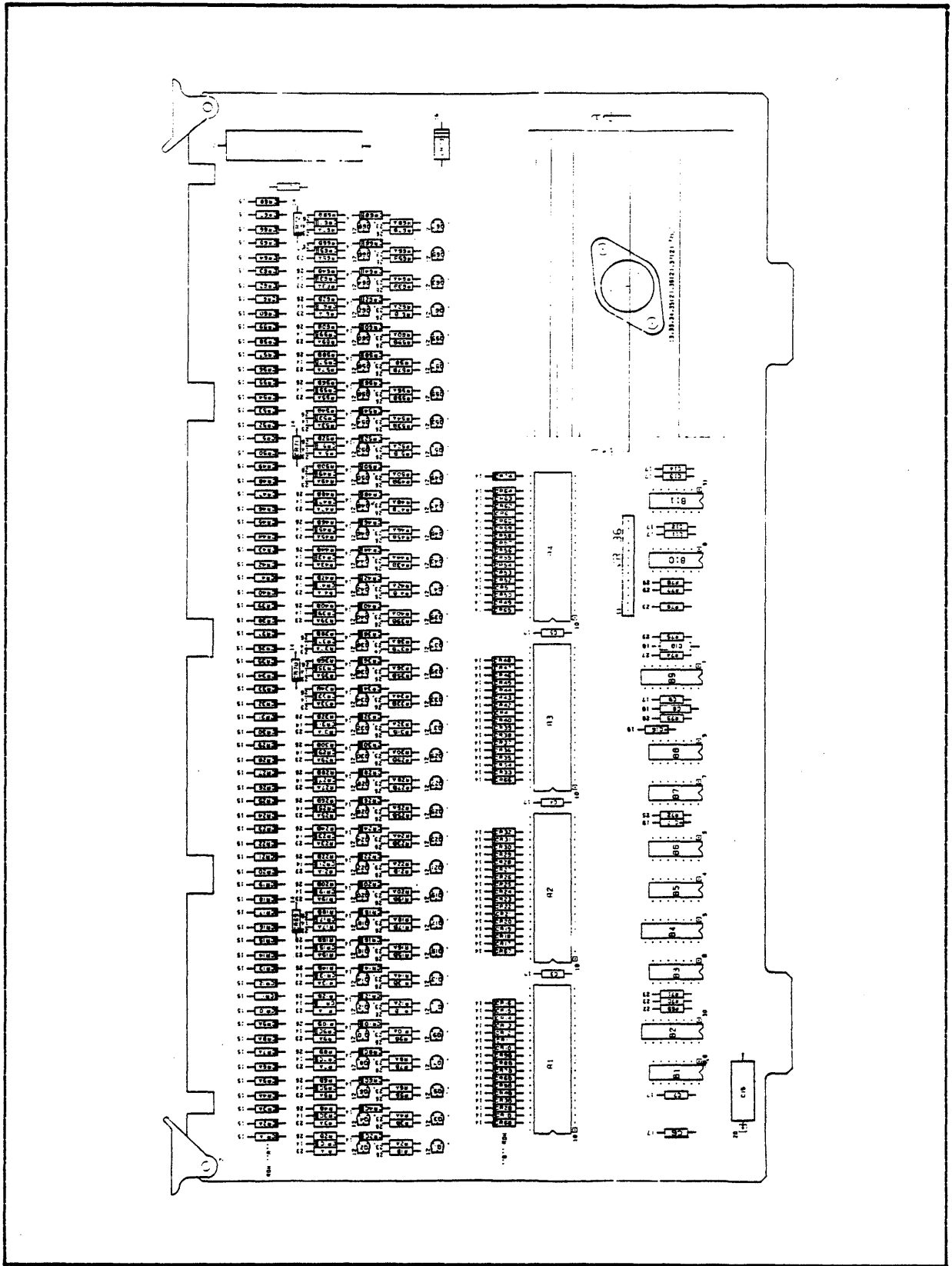
FORM 1000-1 (REV 8-61) 700070

11-54



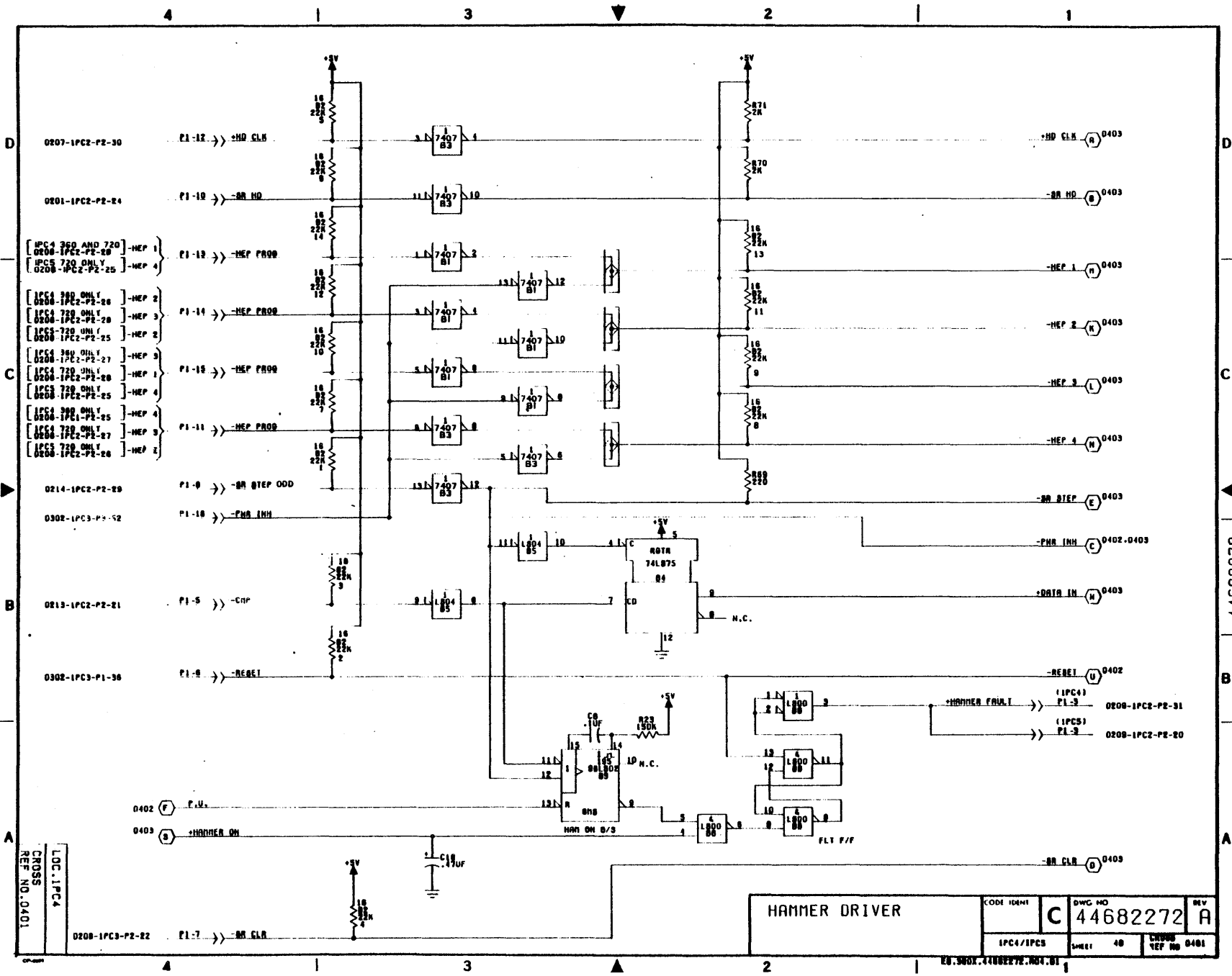
LOC. 1-PCB
CROSS
REF NO. 0307

PRINT HEAD PCB		CODE IDENT	DWG NO	REV
		C	44682272	A
IPC3	SHEET	47	CROSS REF NO 0307	



HAMMER DRIVER PCB ASSEMBLY

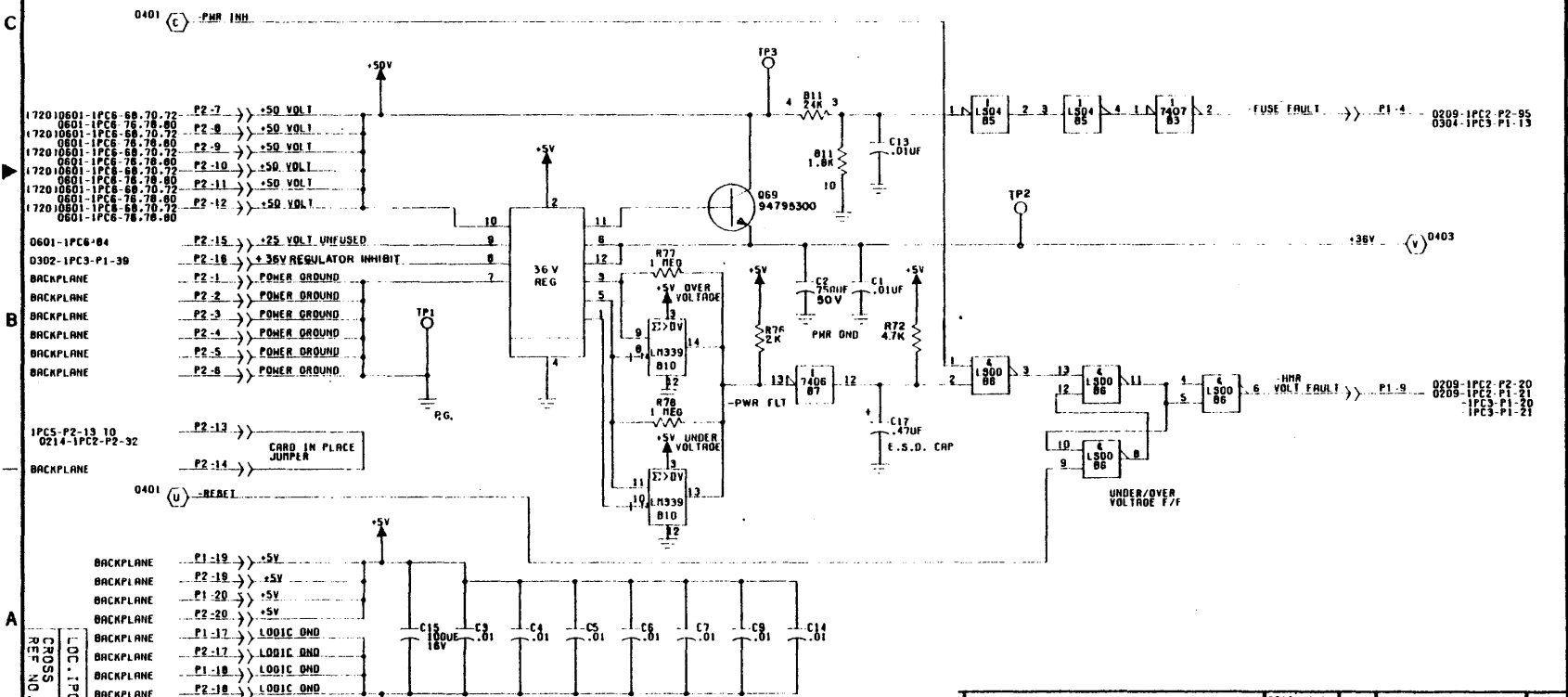
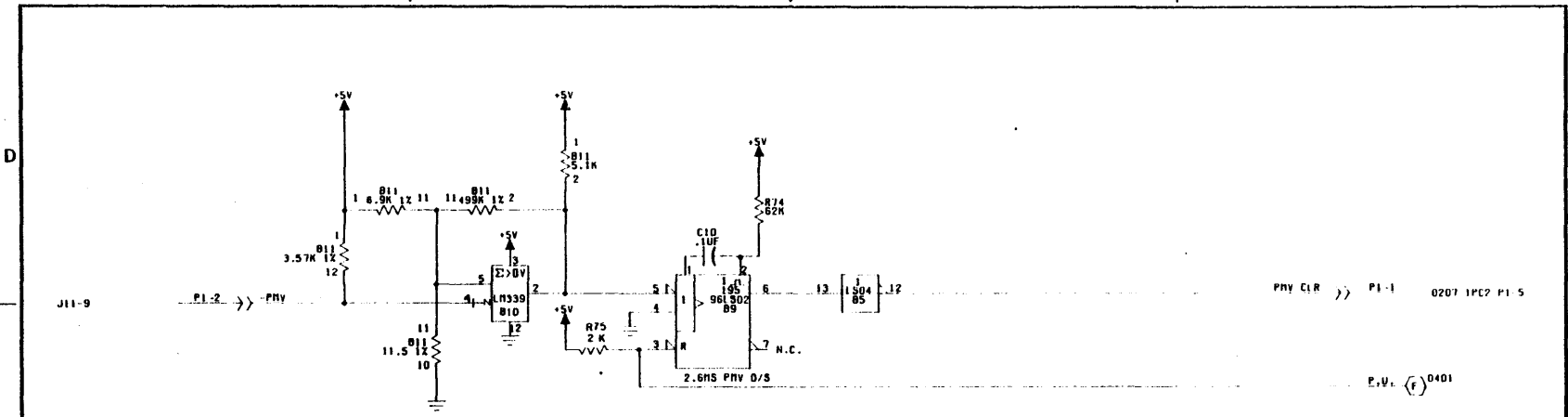
11-56



LOC. 1PC4
CROSS
5600
REF. NO. 0401

HAMMER DRIVER

CODE IDENT	C	DWG. NO.	44682272	REV.	A
IPC4/IPC5		SHEET	48	CROSS REF. NO.	0401



11-57

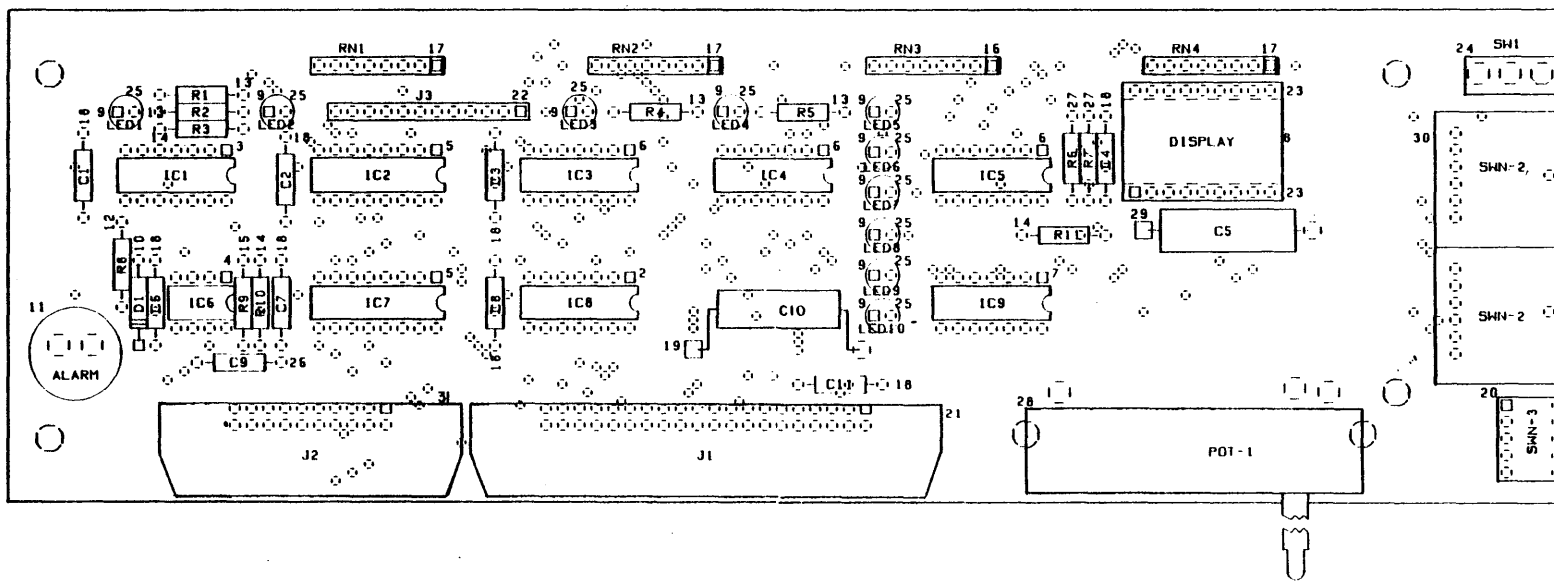
CROSS REF NO 0402
LOC: PC4

HAMMER DRIVER
PAPER MOTION VERIF.
AND 36V REG CIRCUITS

CODE IDENT	C	DWG NO	44682272	REV	A
IPC4/IPC5		SHEET	49	CROSS REF NO	0402

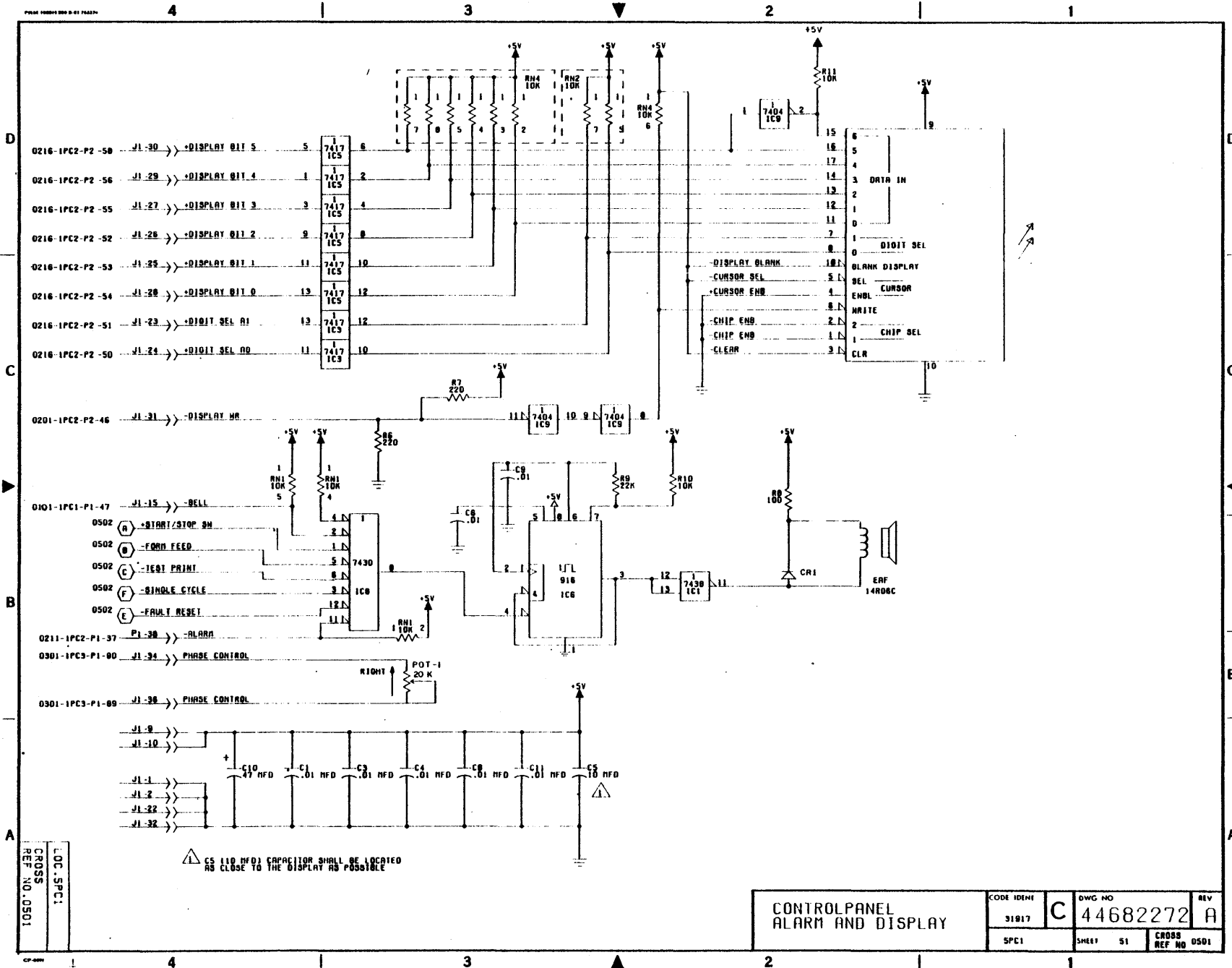
4682272

11-59



CONTROL PANEL PCB ASSEMBLY

11-60



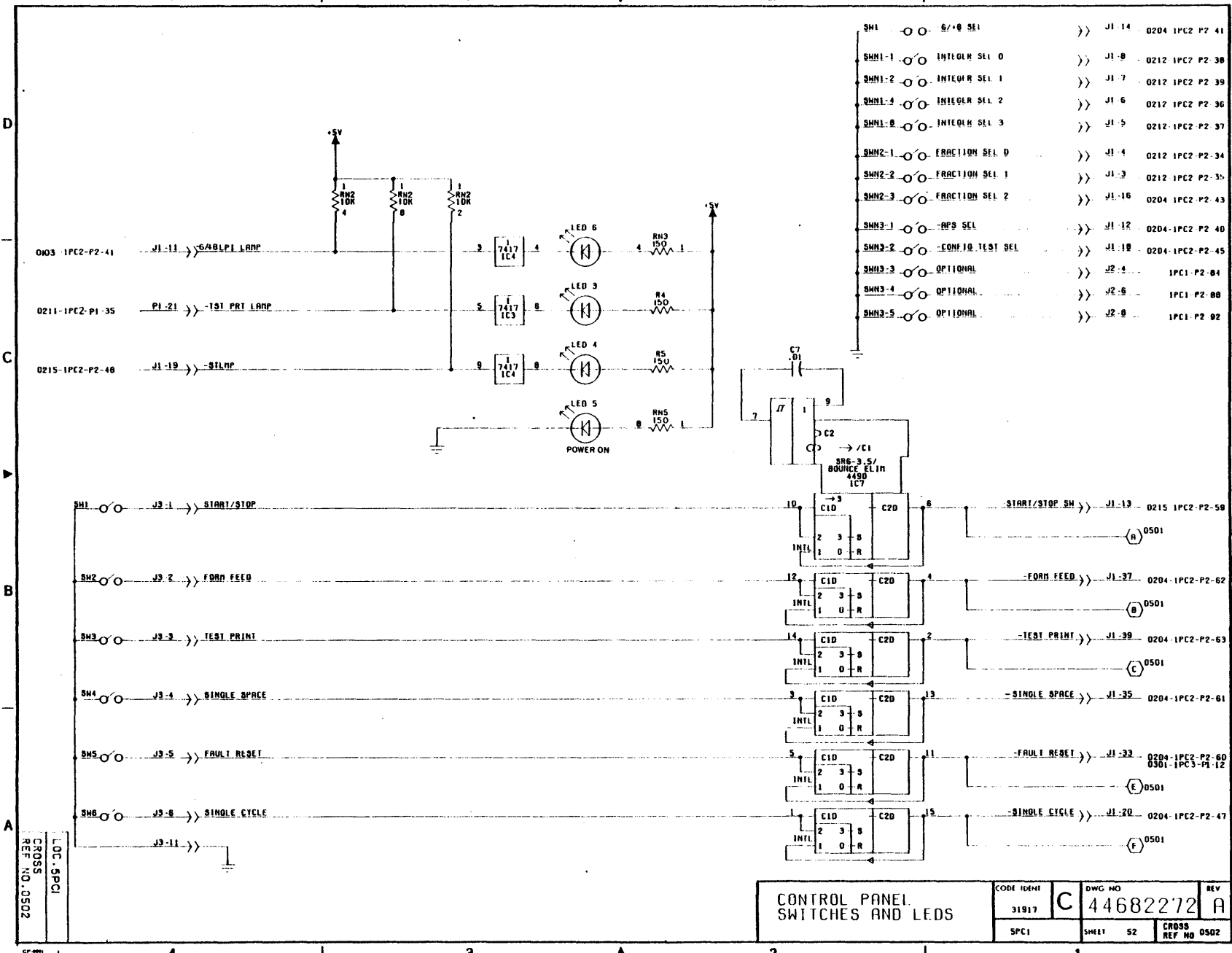
LOC. SPEC.
 CROSS REF. NO. 0501

CONTROL PANEL
 ALARM AND DISPLAY

CODE IDENT	DWG NO	REV
31817	C 44682272	A
SPC1	SHEET 51	CROSS REF NO 0501

11-61

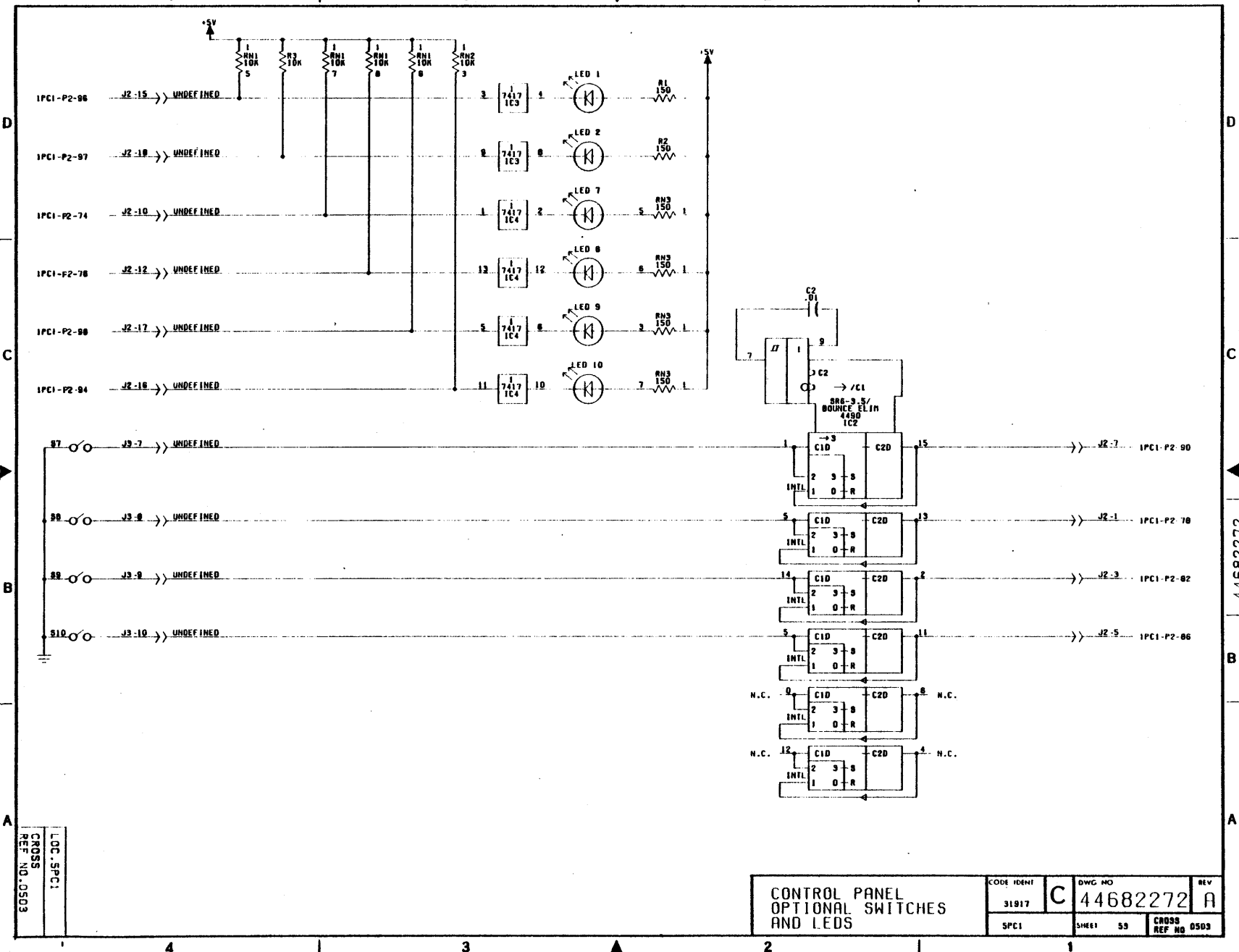
44682272



CONTROL PANEL SWITCHES AND LEDES		CODE IDENT	DWG NO	REV
		31917	C 44682272	A
SPC1	SHEET 52	CROSS REF NO	0502	

LOC. SPC1
CROSS REF NO. 0502

11-62



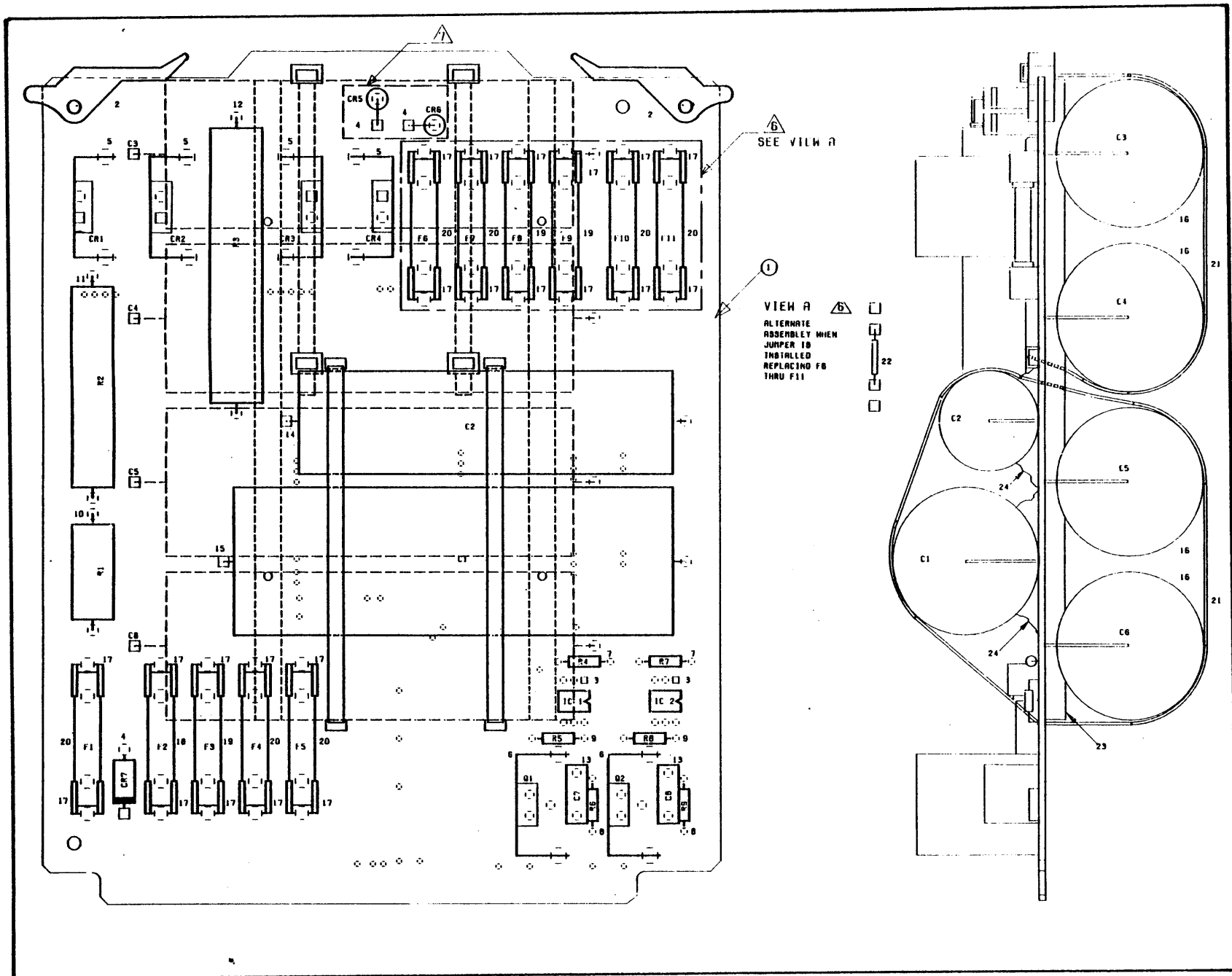
LOC. SPC1
 CROSS
 REF. NO. 0503

CONTROL PANEL
 OPTIONAL SWITCHES
 AND LEDES

CODE IDENT	DWG NO	REV
31917	C 44682272	A
SPC1	SHEET 53	CROSS REF NO 0503

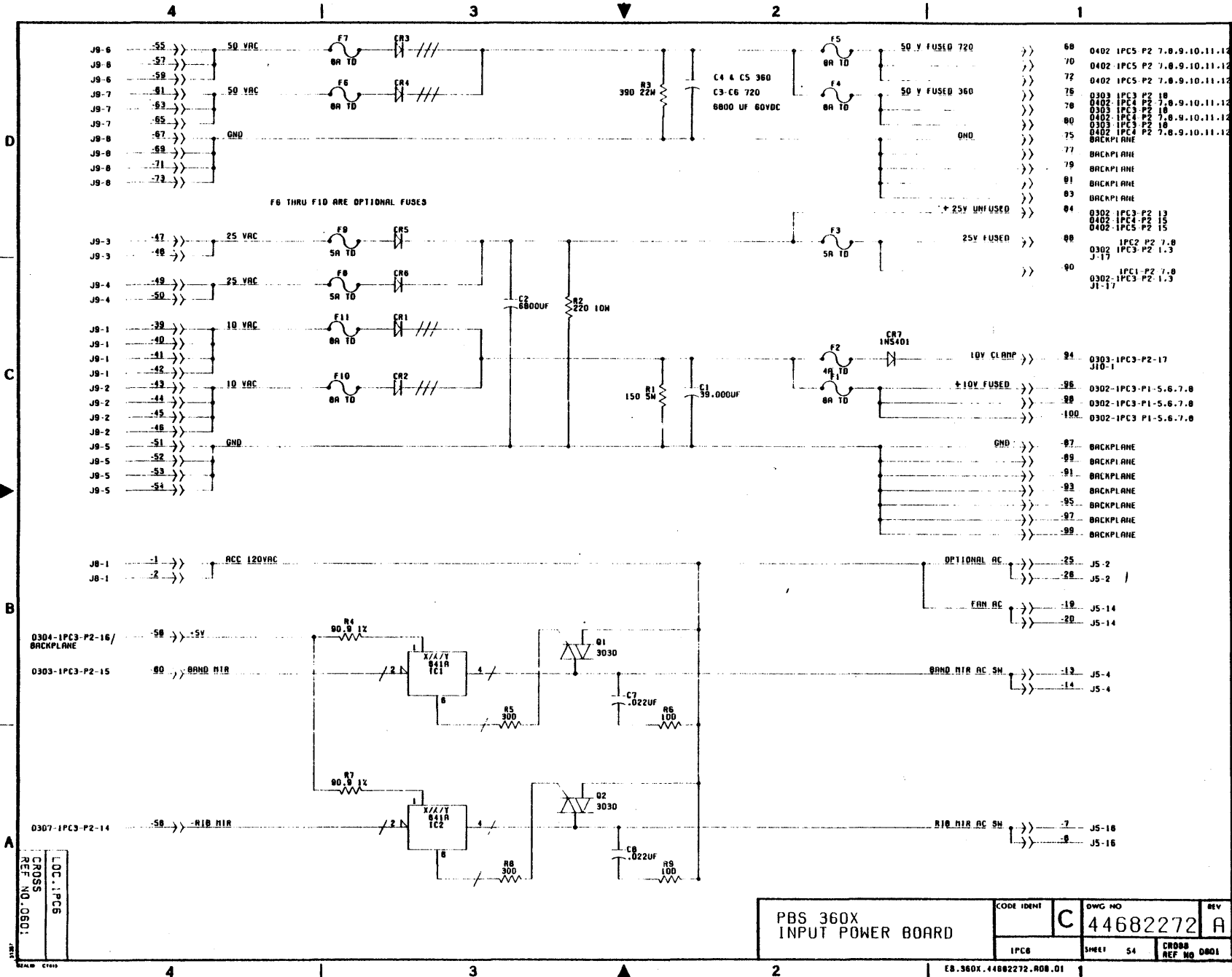
44682272

11-63



INPUT POWER PCB ASSEMBLY

11-64



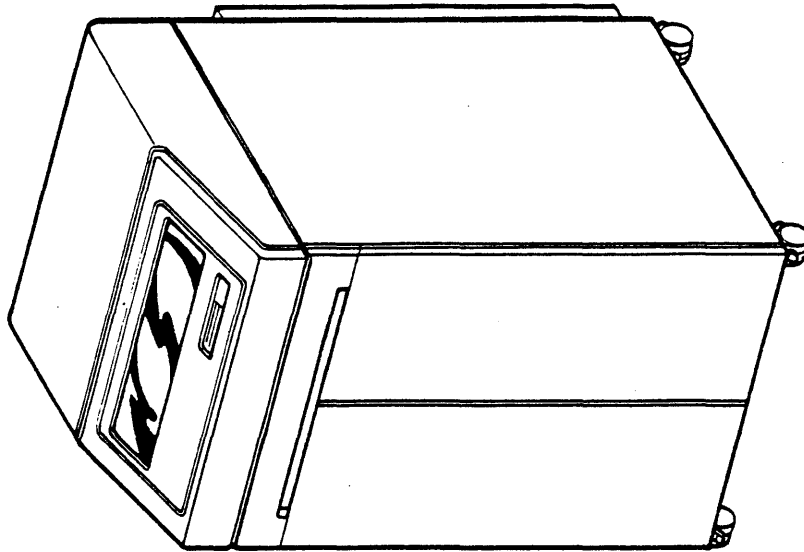
LOC. PCB
CROSS
REF. NO. 0801

PBS 360X
INPUT POWER BOARD

CODE IDENT	DWG NO	REV
IPC6	C 44682272	A
SHEET 54	CROSS REF NO 0801	

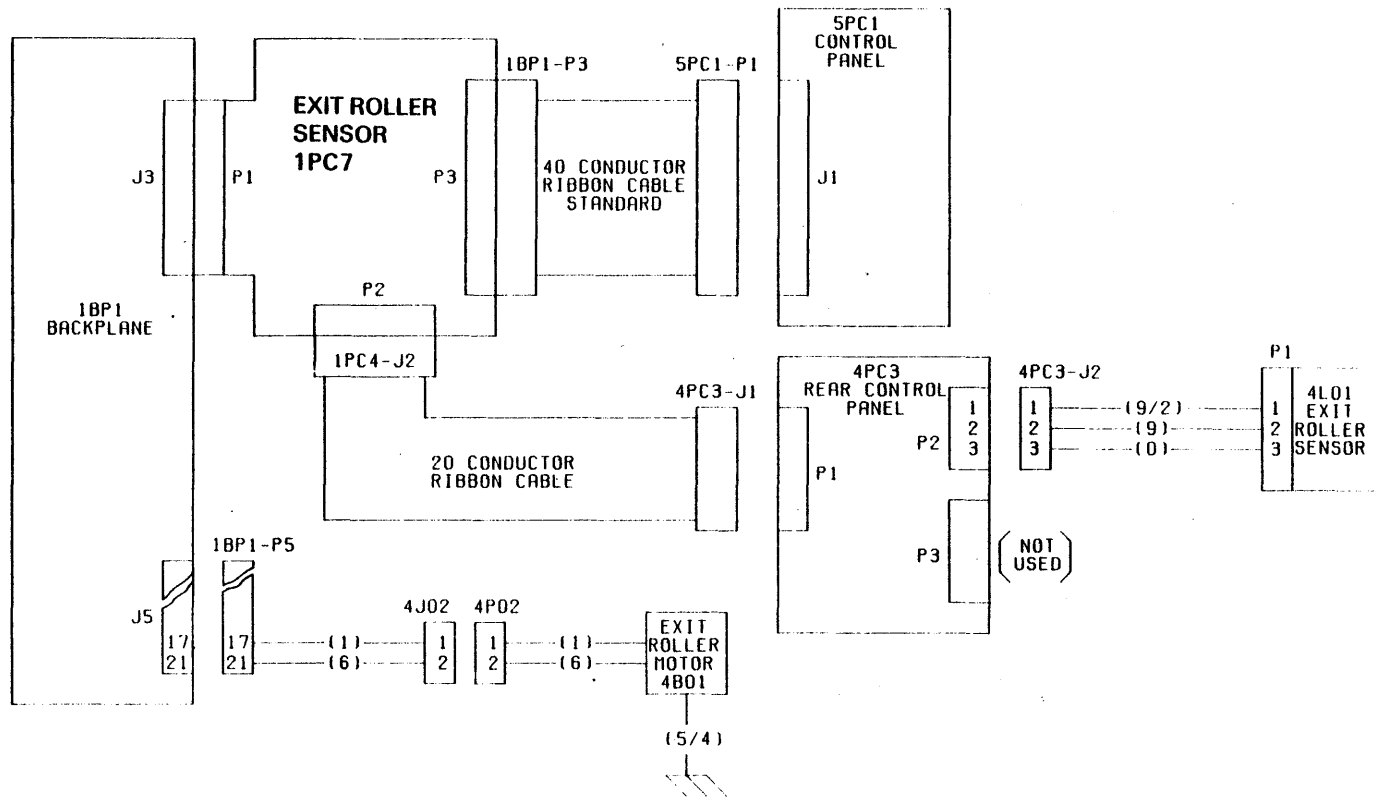
EB.360X.44682272.A08.01 1

44682272



QUIET CABINET WIRING DIAGRAMS

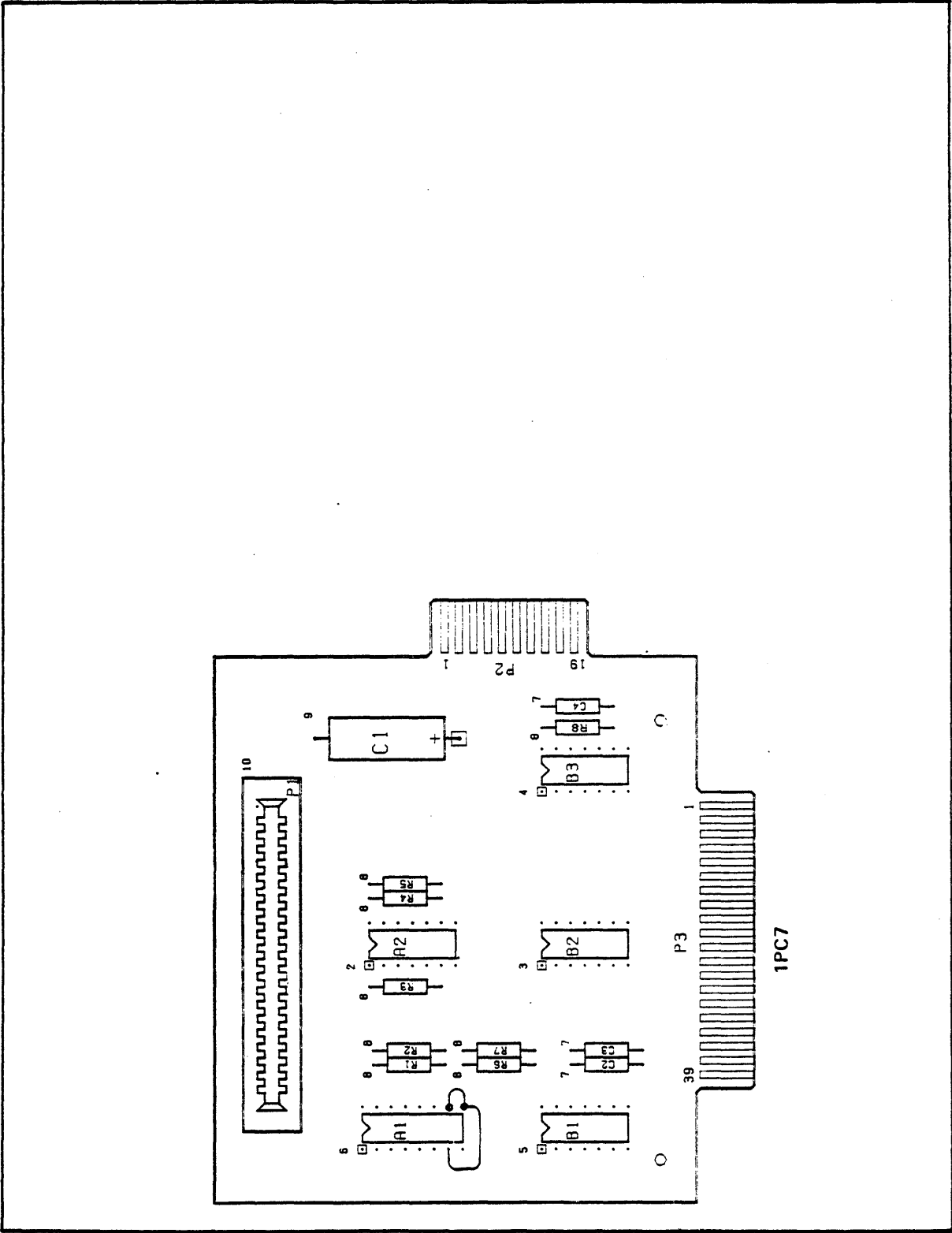
11-66



LOC.
CROSS
REF. NO. A001

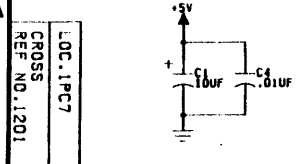
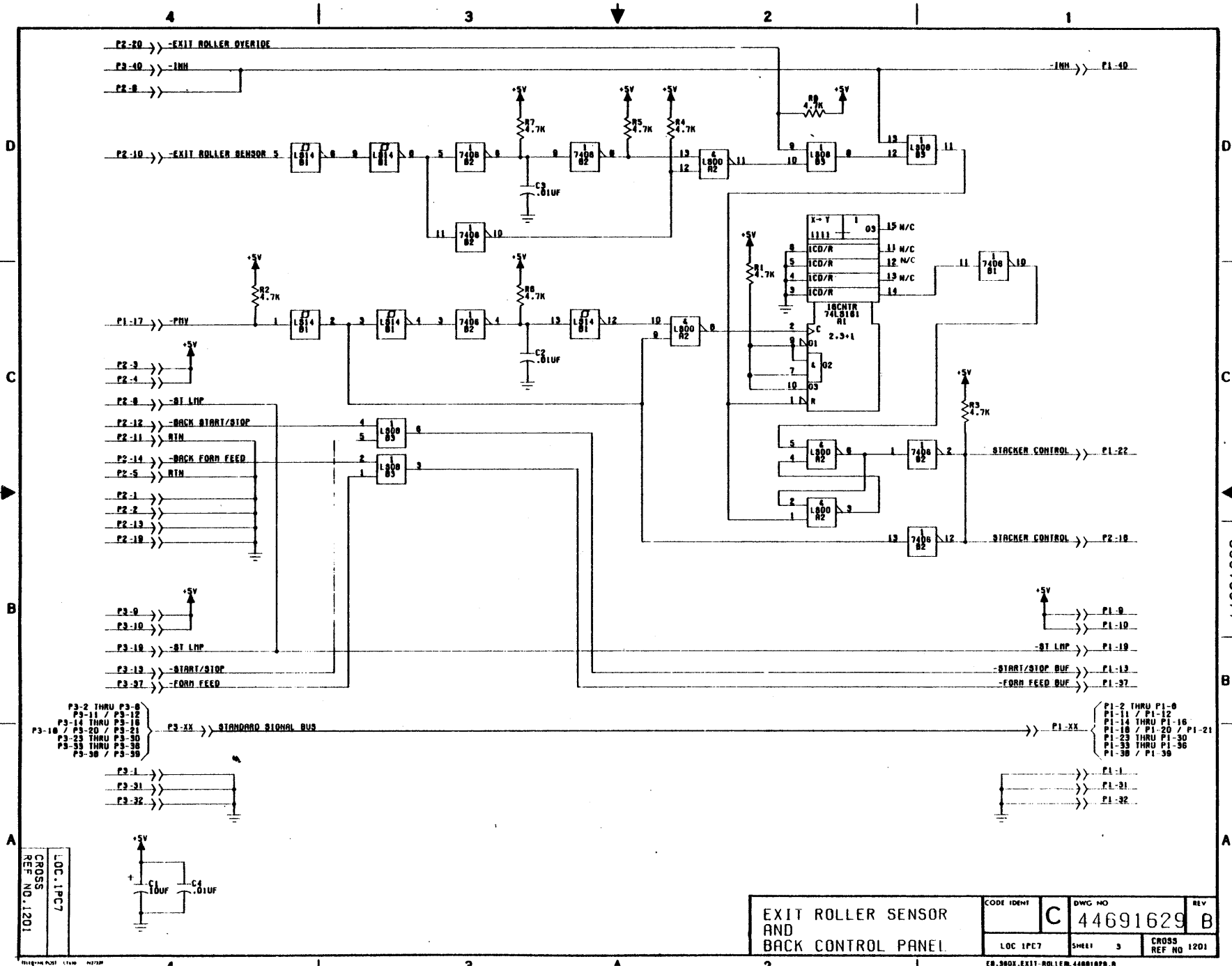
QUIET CABINET
OPTION WIRING
DIAGRAM

CODE IDENT	C	DWG. NO	44691629	REV	A
SHEET	2	CROSS REF. NO.	H001		



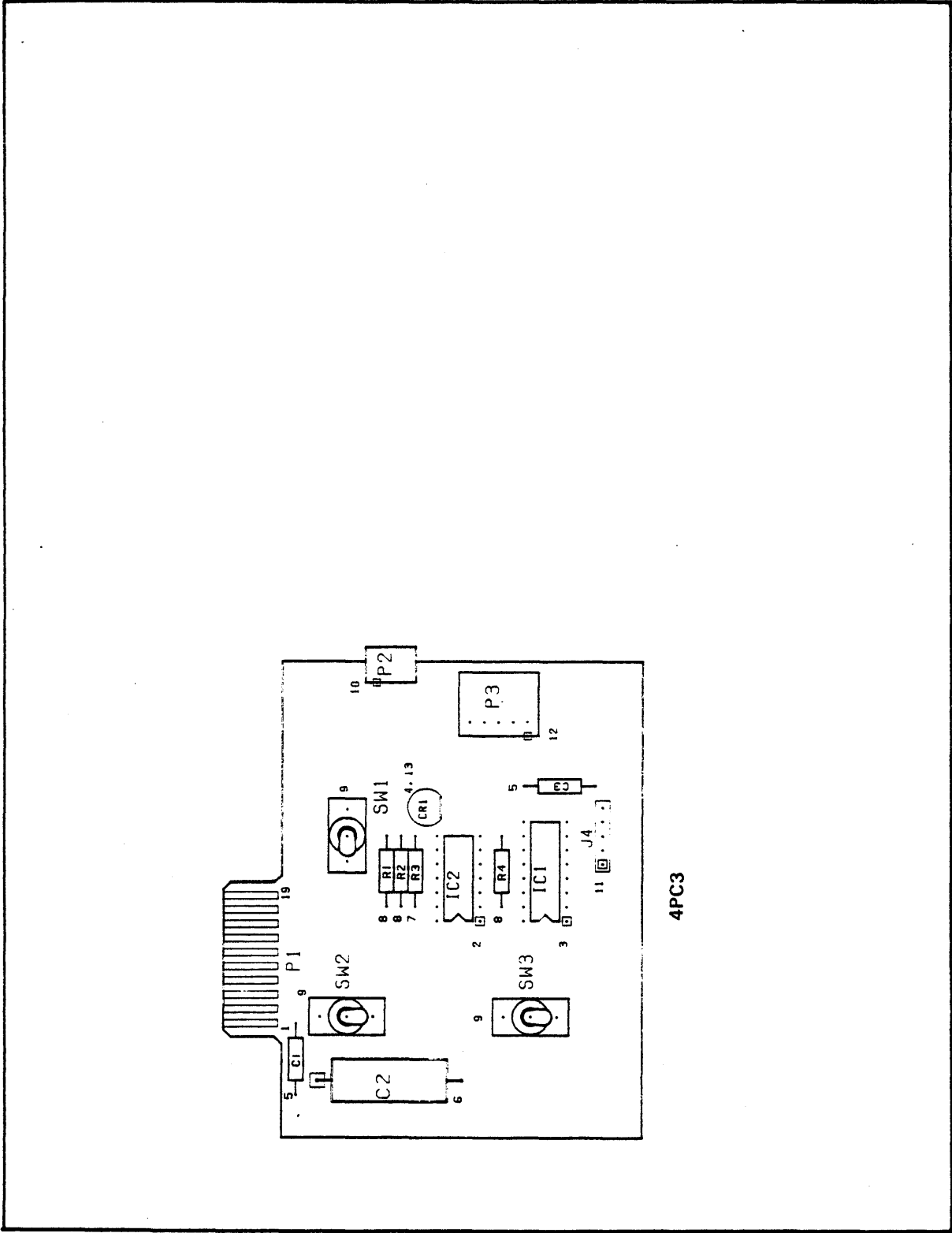
EXIT ROLLER SENSOR AND BACK CONTROL PANEL

11-68



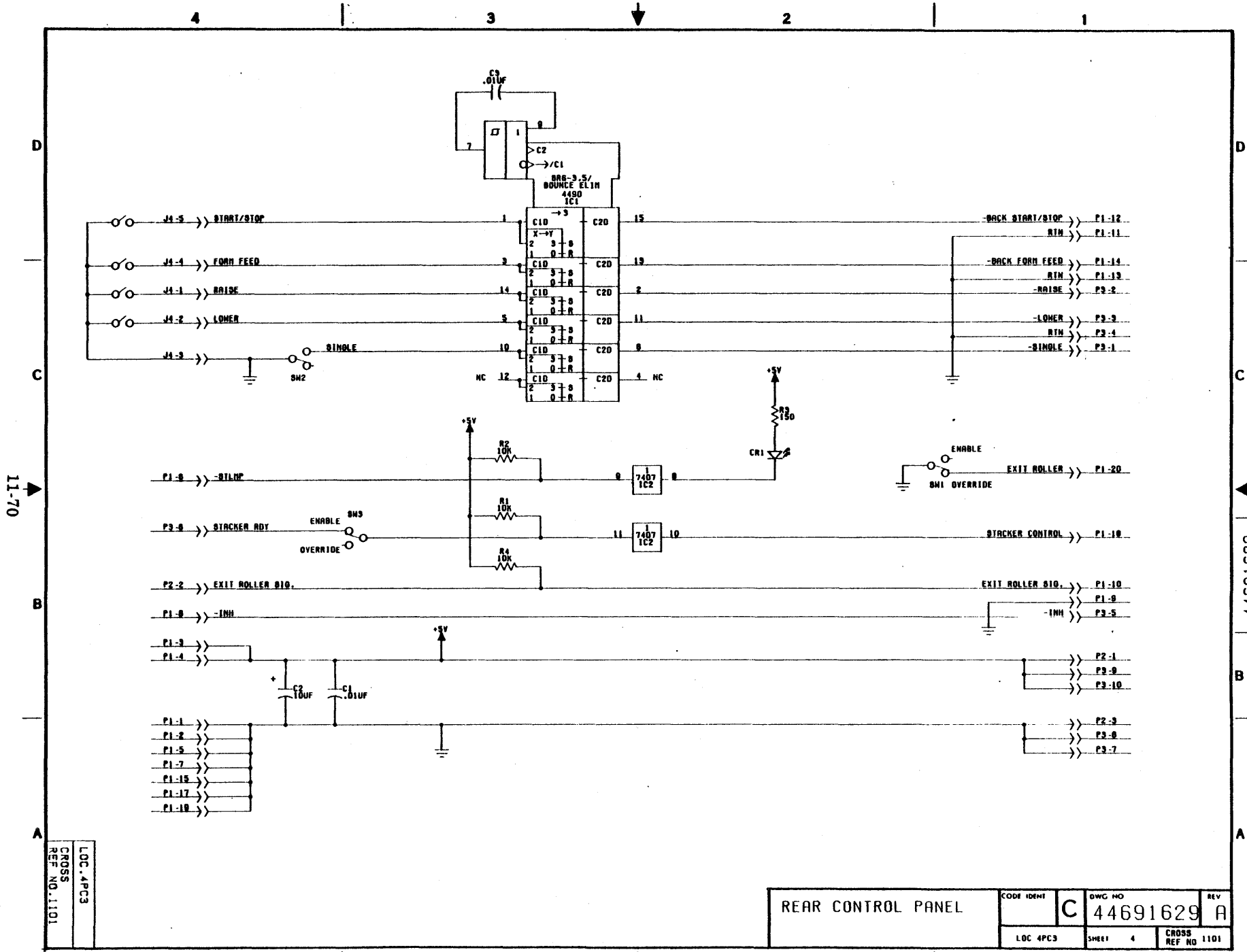
LOC. 1PC7
CROSS
REF. NO. 1201

EXIT ROLLER SENSOR AND BACK CONTROL PANEL.		CODE IDENT C	DWG NO 44691629	REV B
LOC 1PC7	SHEET 3	CROSS REF NO 1201		



4PC3

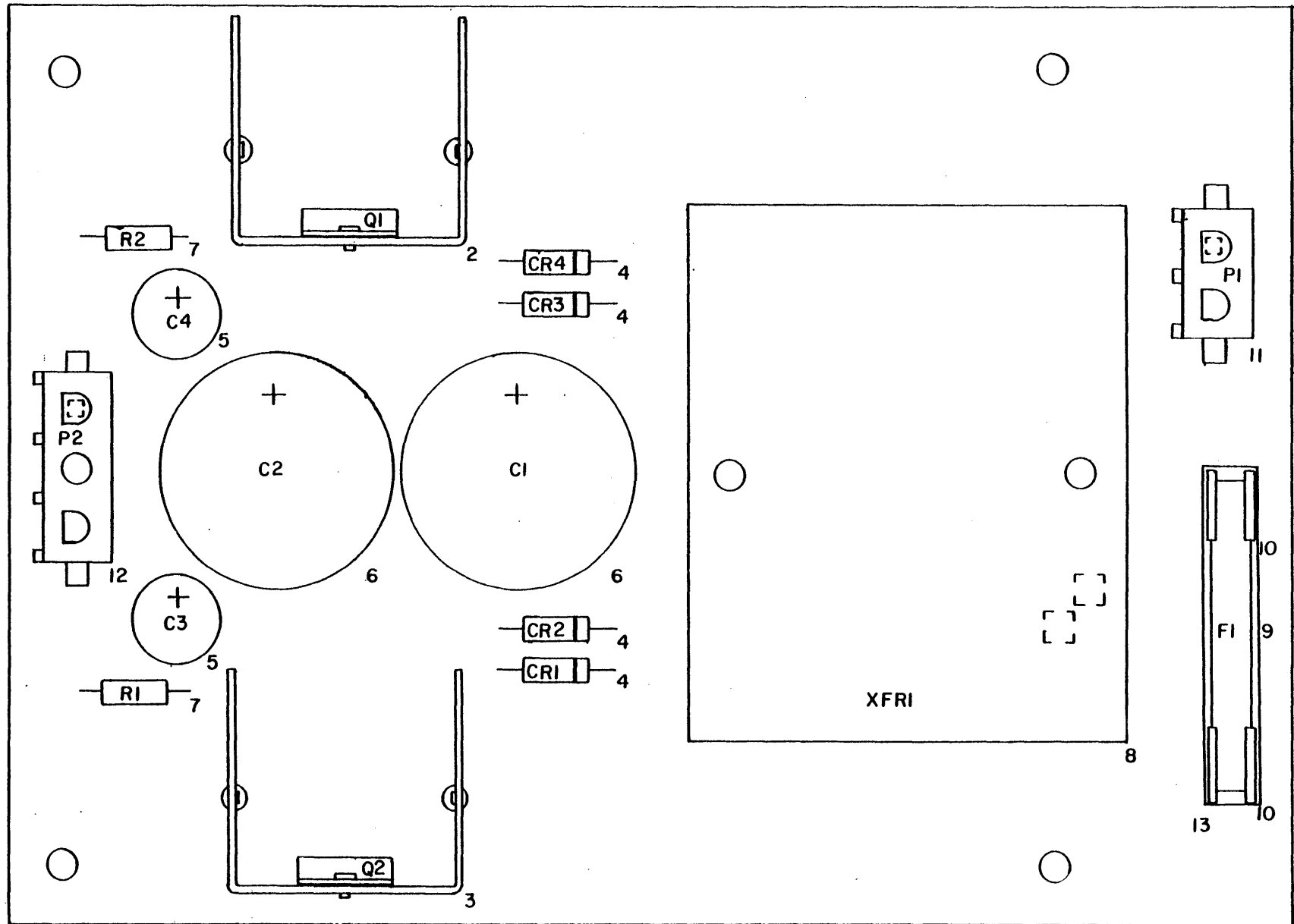
REAR CONTROL PANEL



LOC. 4PC3
 CROSS
 REF. NO. 1101

REAR CONTROL PANEL		CODE IDENT	OWG NO	REV
			C 44691629	A
LOC 4PC3	SHEET 4	CROSS REF NO 1101		

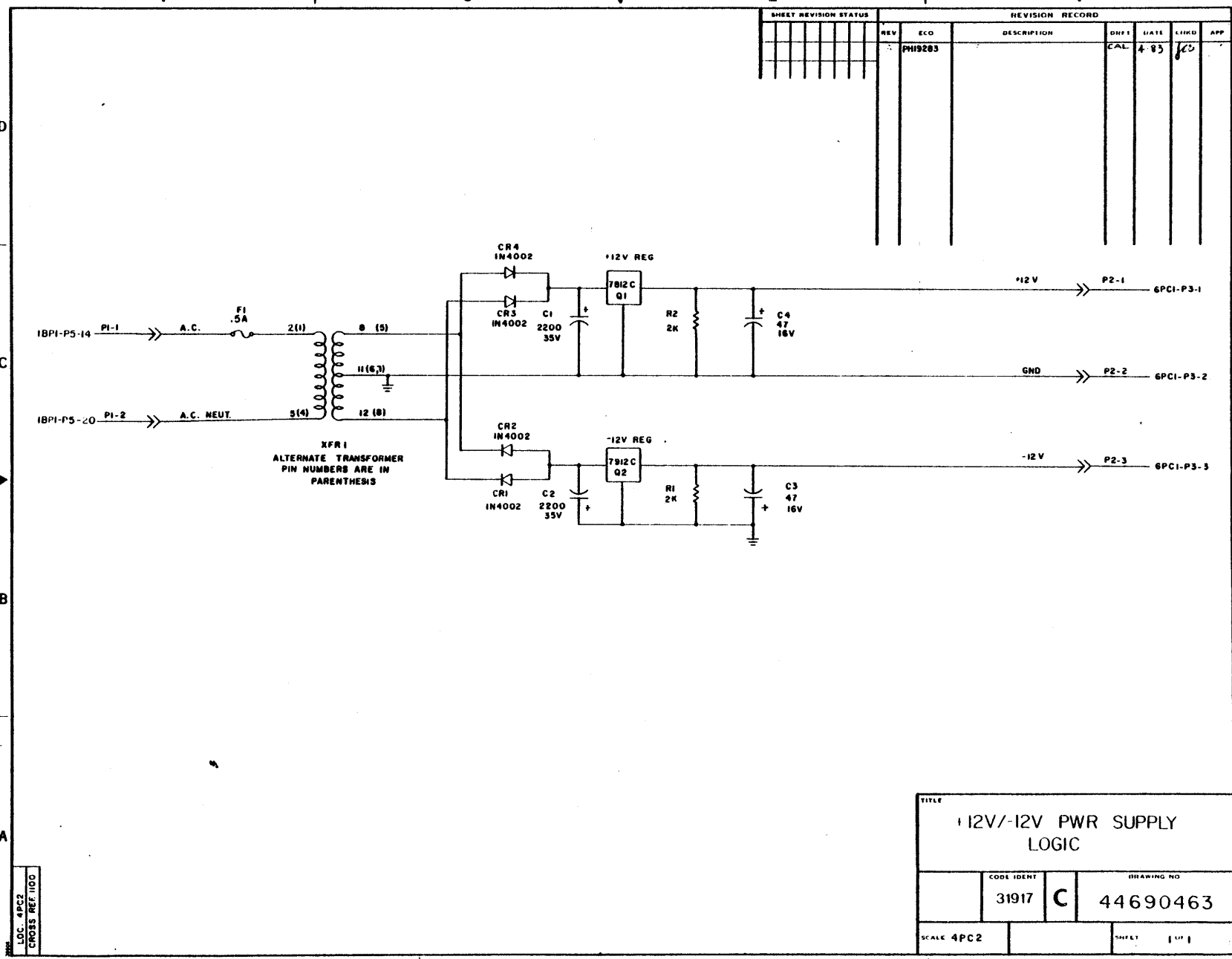
11-71



± 12 VOLT POWER SUPPLY

4 | 3 | 2 | 1

SHEET REVISION STATUS				REVISION RECORD			
REV	ECO	DESCRIPTION	DRFT	DATE	LINKD	APP	
	PH19283		CAL	4 83	JCS		



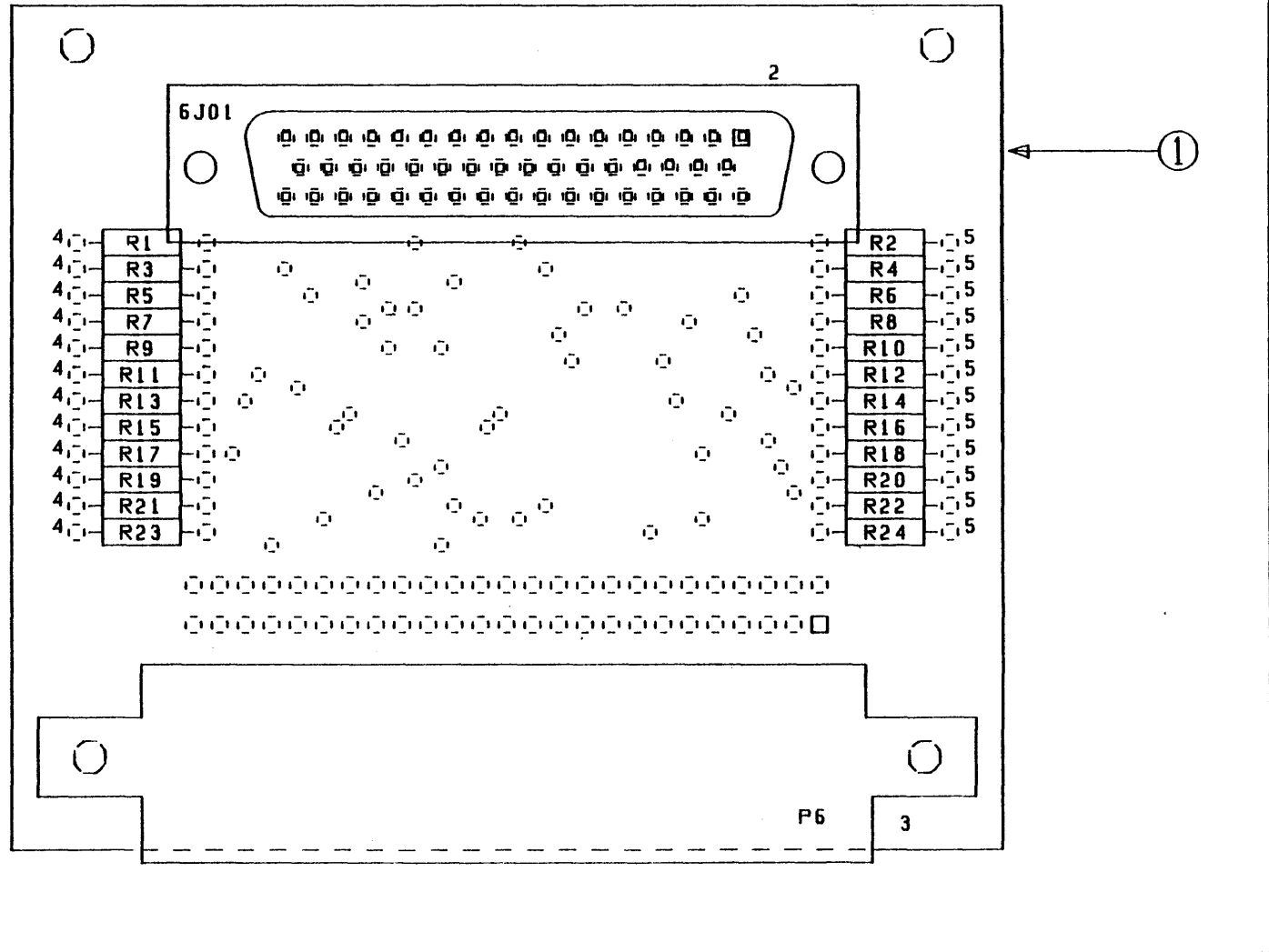
11-72

44690463

TITLE			
+12V/-12V PWR SUPPLY LOGIC			
CODE IDENT	DRAWING NO		
31917 C	44690463		
SCALE 4PC2	SHEET	1 OF 1	

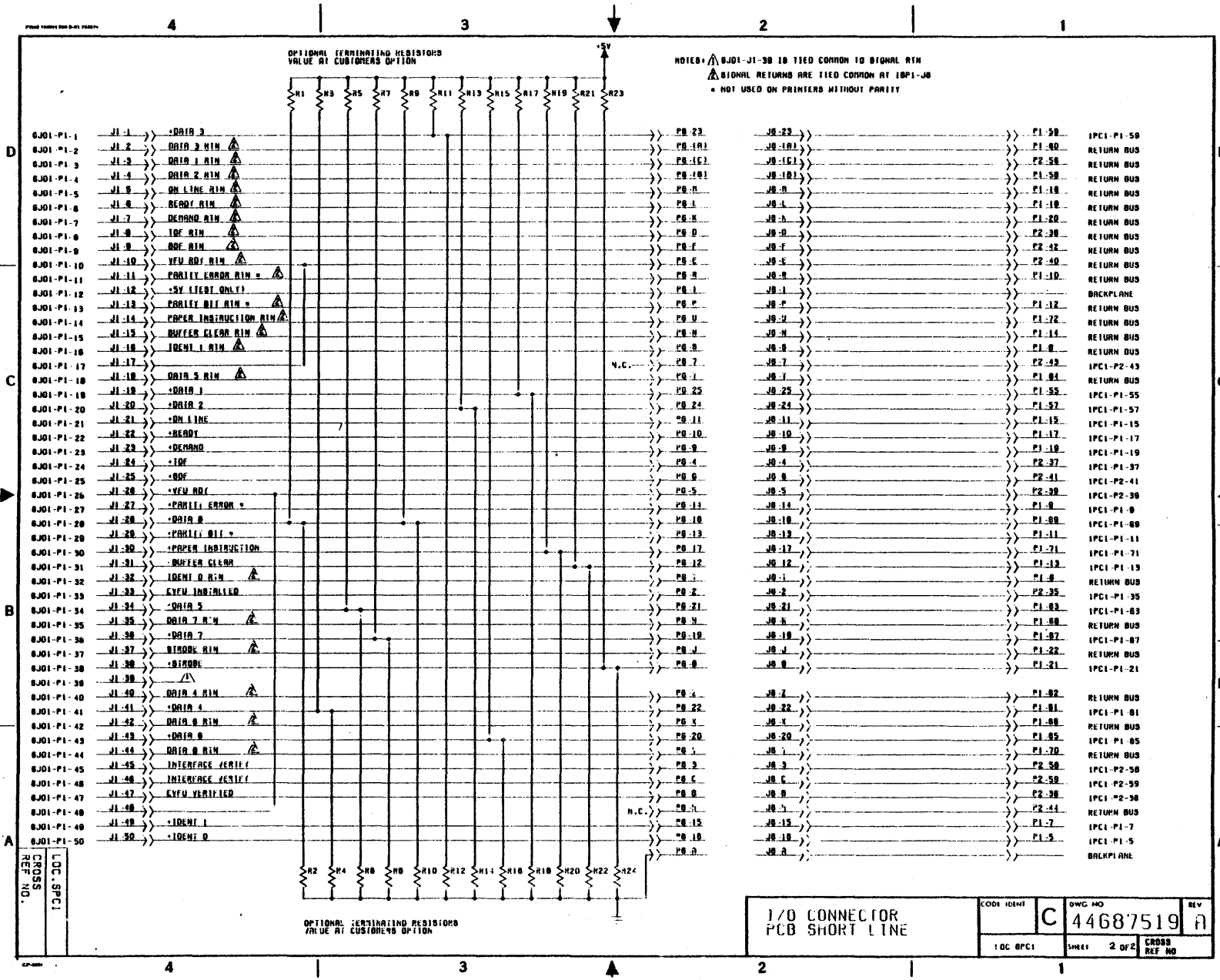
4 | 3 | 2 | 1

SECTION XII
LOGIC DIAGRAMS-I/O ADAPTORS

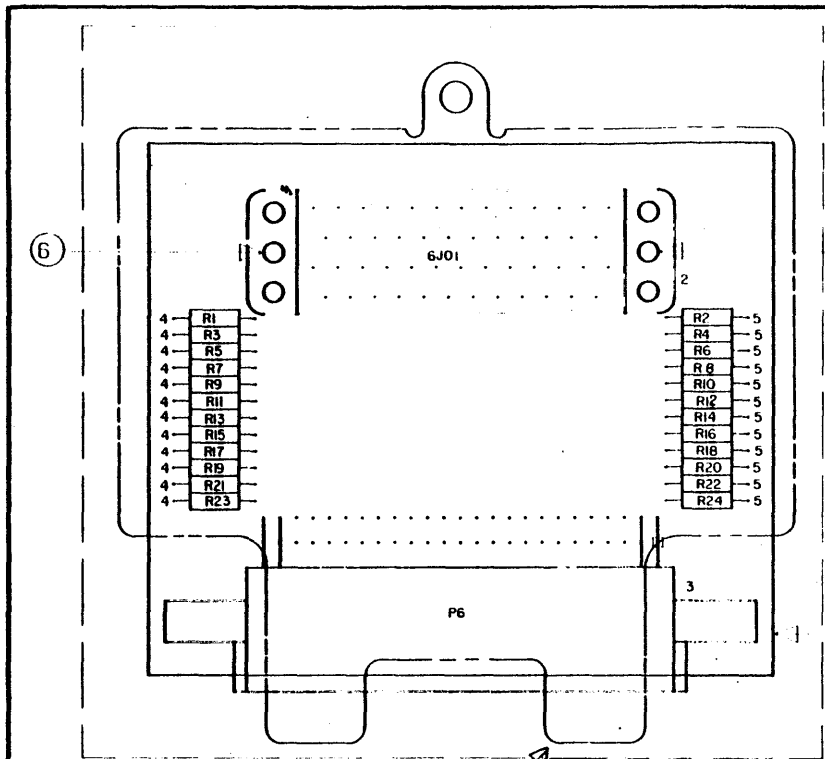


I/O ADAPTOR - D TYPE, SHORT LINE

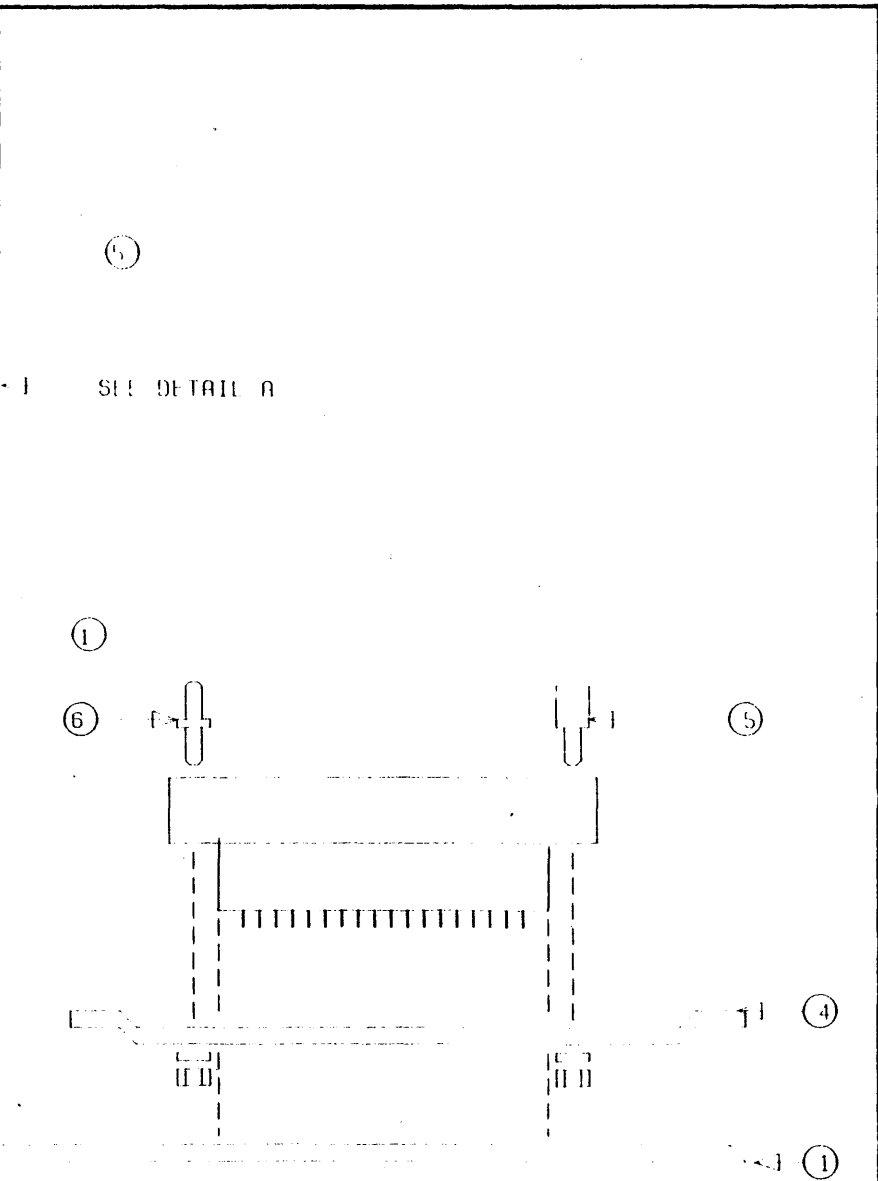
12-4



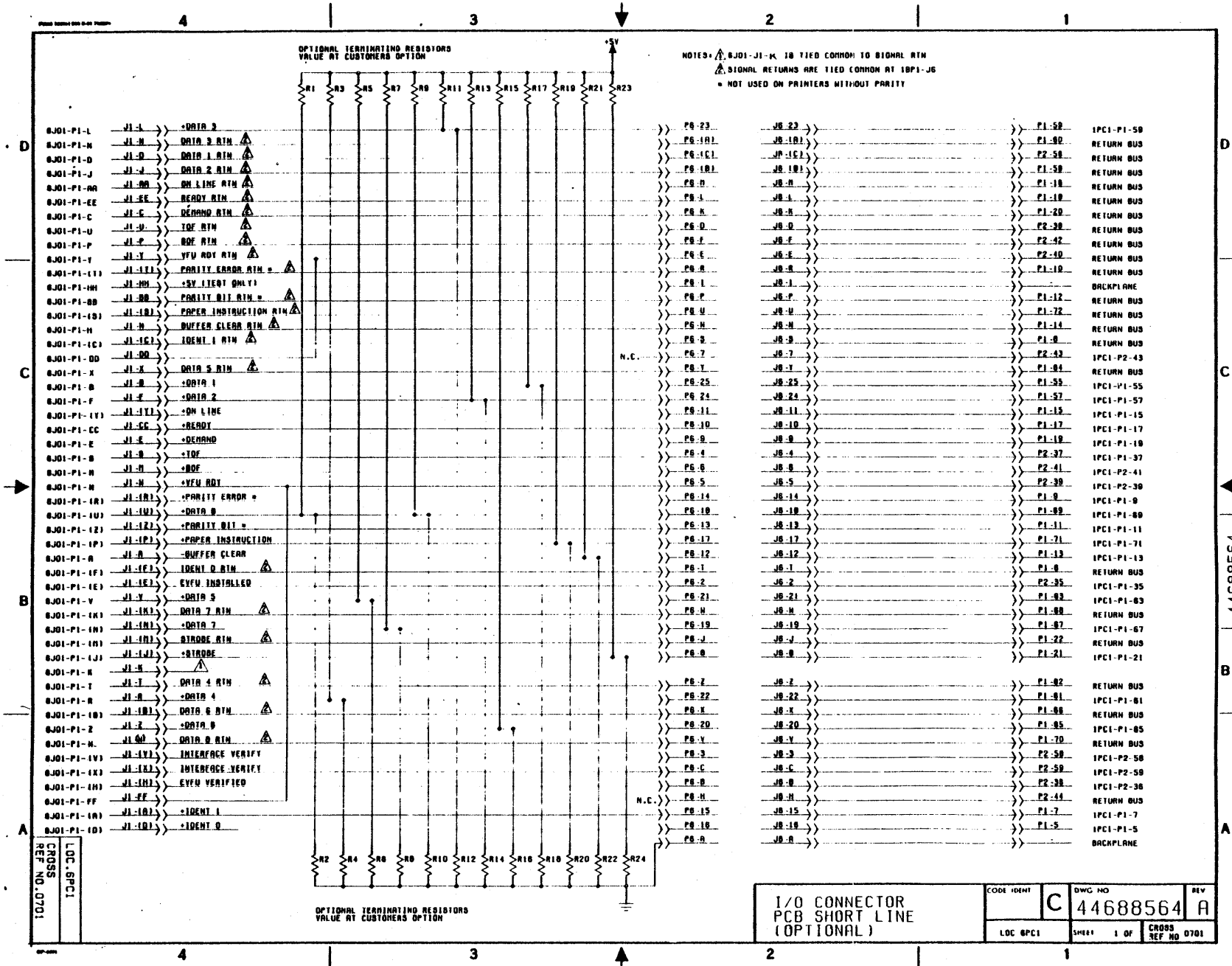
I/O CONNECTOR PCB SHORT LINE		CODE IDENT	DWG NO	REV
		C	44687519	A
1 OC 0PC1	SHEET	2 OF 2	CROSS REF NO	



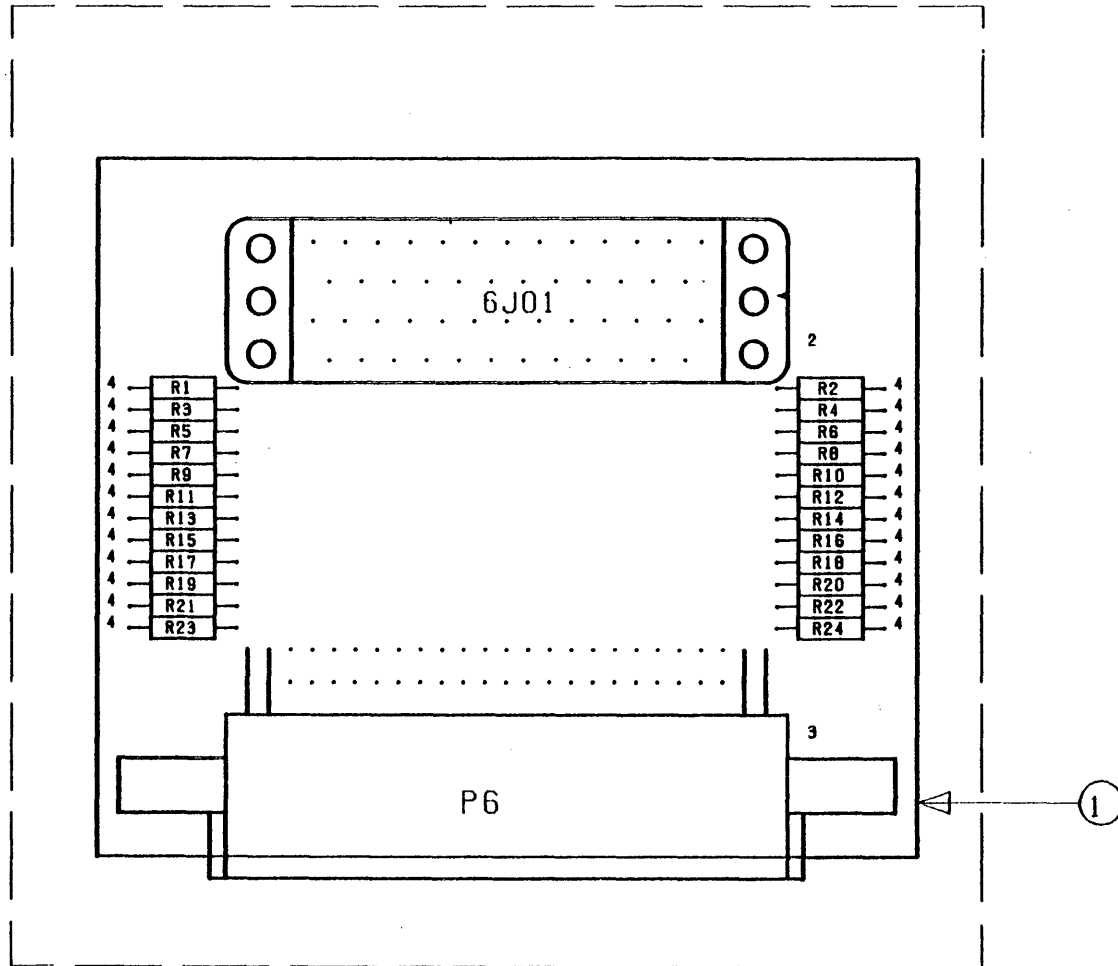
F.N. 4 SHOWN IN PHANTOM
OUTLINE FOR CLARITY



DETAIL A
CONNECTOR ASSEMBLY
(NO SCALE)



44688564



I/O ADAPTOR - WINCHESTER TYPE, SHORT LINE-PARADYNE

CROSS REF. NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44691456

PART NO: 44691457
REV: A
DATE: 10-26-83
PAGE: 2 of 3

LOGIC SIGNAL CROSS REF. DETACHED LIST

MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF. NO.</u>
0104/1PC1	+INTERFACE VERIFY	0701/P6-3
0104/1PC1	INTERFACE VERIFY RETURN	0701/P6-C
0101/1PC1	+IDENT 0	0701/P6-16
0101/1PC1	GND	0701/P6-T
0101/1PC1	+IDENT 1	0701/P6-15
0103/1PC1	+TOP OF FORMS	0701/P6-S
0103/1PC1	+IDENT 1	0701/P6-4
0103/1PC1	GND	0701/P6-D
0103/1PC1	+BOTTOM OF FORMS	0701/P6-6
0103/1PC1	GND	0701/P6-F
0103/1PC1	+VFU RDY	0701/P6-5
0103/1PC1	GND	0701/P6-E
0103/1PC1	+DEMAND	0701/P6-9
0103/1PC1	GND	0701/P6-K
0103/1PC1	EVFU VERIFY	0701/P6-2
0103/1PC1	EVFU INSTALLED	0701/P6-B
0103/1PC1	+5V	0701/P6-1
0103/1PC1	GND	0701/P6-A

CROSS REF. NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44691456

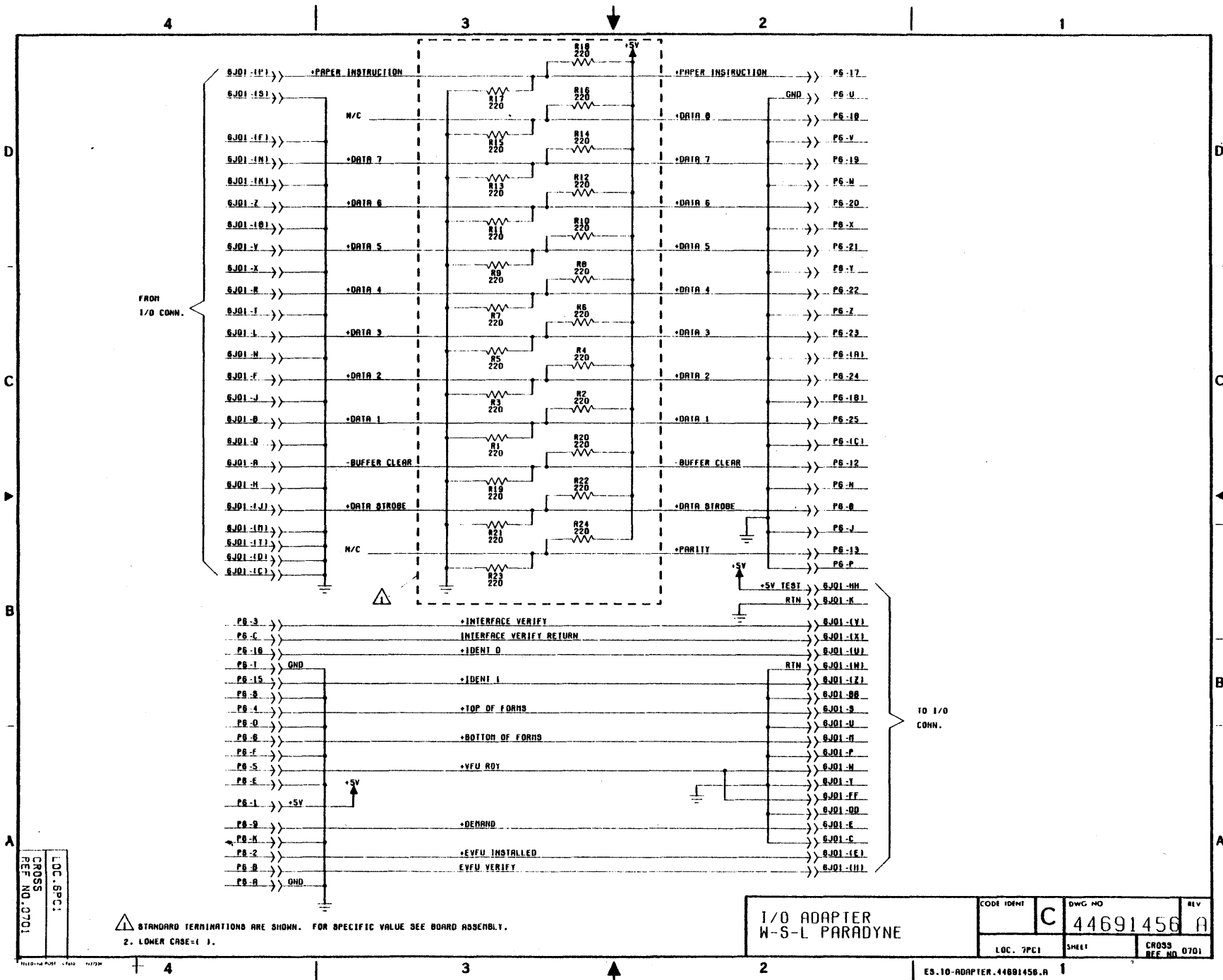
PART NO: 44691457
REV: A
DATE: 10-26-83
PAGE: 3 of 3

LOGIC SIGNAL CROSS REF. DETACHED LIST

MODULE OUTPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
0701/P6-17	+PAPER INSTRUCTION	0102/1PC1
0701/P6-U	RTN	0102/1PC1
0701/P6-18	+DATA 8	0102/1PC1
0701/P6-V	RTN	0102/1PC1
0701/P6-19	+DATA 7	0102/1PC1
0701/P6-W	RTN	0102/1PC1
0701/P6-20	+DATA 6	0102/1PC1
0701/P6-X	RTN	0102/1PC1
0701/P6-21	+DATA 5	0102/1PC1
0701/P6-Y	RTN	0102/1PC1
0701/P6-22	+DATA 4	0102/1PC1
0701/P6-Z	RTN	0102/1PC1
0701/P6-23	+DATA 3	0102/1PC1
0701/P6-(A)	RTN	0102/1PC1
0701/P6-24	+DATA 2	0102/1PC1
0701/P6-(B)	RTN	0102/1PC1
0701/P6-25	+DATA 1	0102/1PC1
0701/P6-(C)	RTN	0102/1PC1
0701/P6-12	-BUFFER CLEAR	0102/1PC1
0701/P6-N	RTN	0102/1PC1
0701/PC-8	+DATA STROBE	0102/1PC1
0701/P6-J	RTN	0102/1PC1
0701/P6-13	+PARITY	0102/1PC1
0701/P6-P	RTN	0101/1PC1

12-10

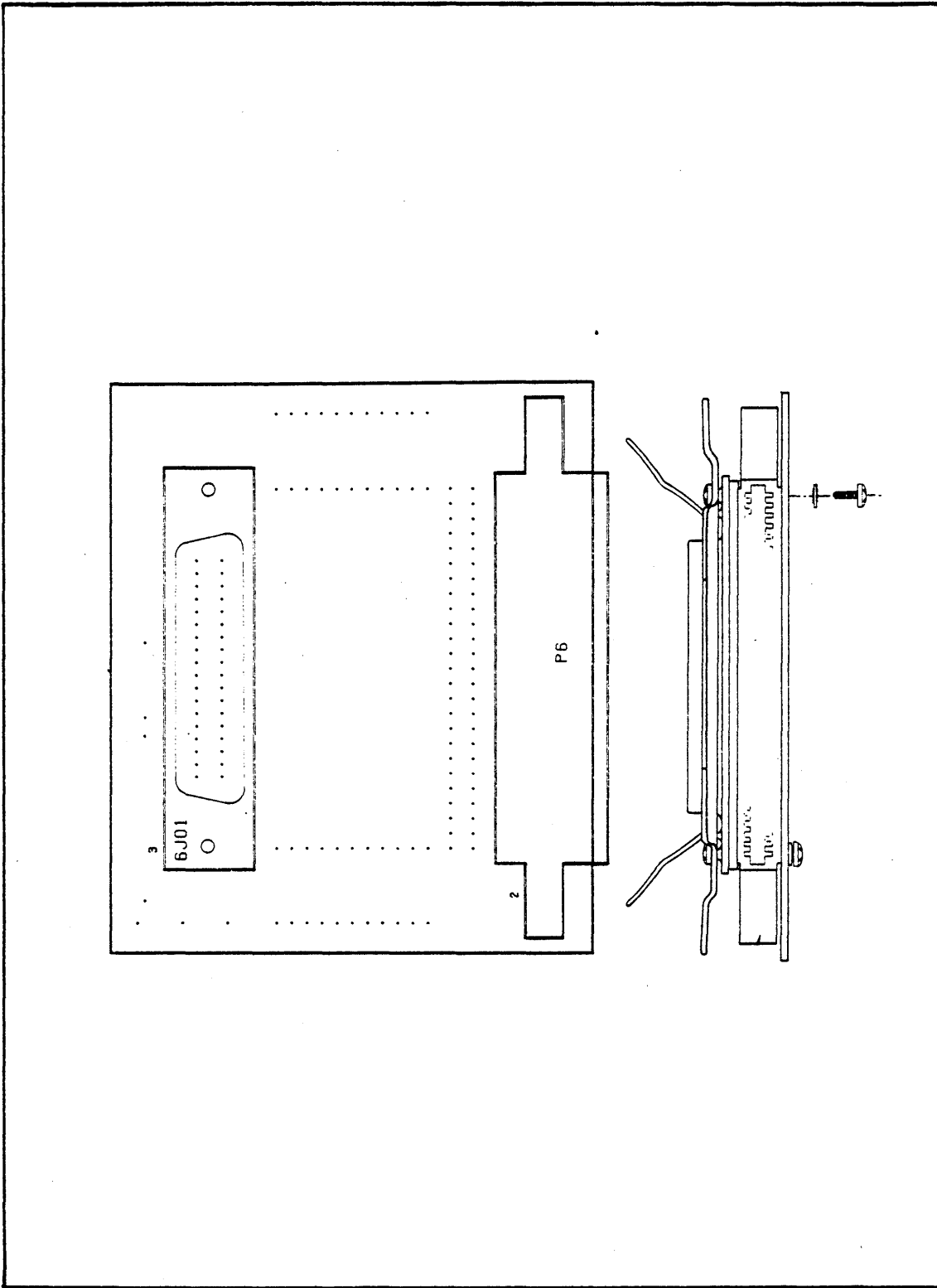


LOC. 6PC1
 CROSS
 REF. NO. 0701

I/O ADAPTER
 W-S-L PARADYNE

CODE IDENT	DWG. NO.	REV.
	C 44691456	A
LOC. 7PCI	SHEET	CROSS REF. NO. 0701

44691456



I/O ADAPTOR - CENTRONICS

CROSS REF. NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44690608

PART NO: 44690609
REV: B
DATE: 8-2-83
PAGE: 2 of 3

LOGIC SIGNAL CROSS REF. DETACHED LIST

MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF. NO.</u>
0101/1PC1	-ACKNOWLEDGE	0701/J6-9
	RTN	0701/J6-K
0101/1PC1	+BUSY	0701/J6-15
	RTN	0701/J6-S
0101/1PC1	+OUT OF PAPER	0701/J6-10
0101/1PC1	+SELECT	0701/J6-11
0101/1PC1	125 KHZ CLK	0701/J6-12
0101/1PC1	-FAULT	0701/J6-16
	GND	0701/J6-R
	+5V	0701/J6-1
	GND	0701/J6-A
	GND	0701/J6-D
	GND	0701/J6-E
	GND	0701/J6-F
	GND	0701/J6-H
	GND	0701/J6-L
	GND	0701/J6-M
	GND	0701/J6-N
	GND	0701/J6-T
0103/1PC1	+VPWR	0701/J6-7

CROSS REF. NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44690608

PART NO: 44690609
REV: B
DATE: 8-2-83
PAGE: 3 of 3

LOGIC SIGNAL CROSS REF. DETACHED LIST

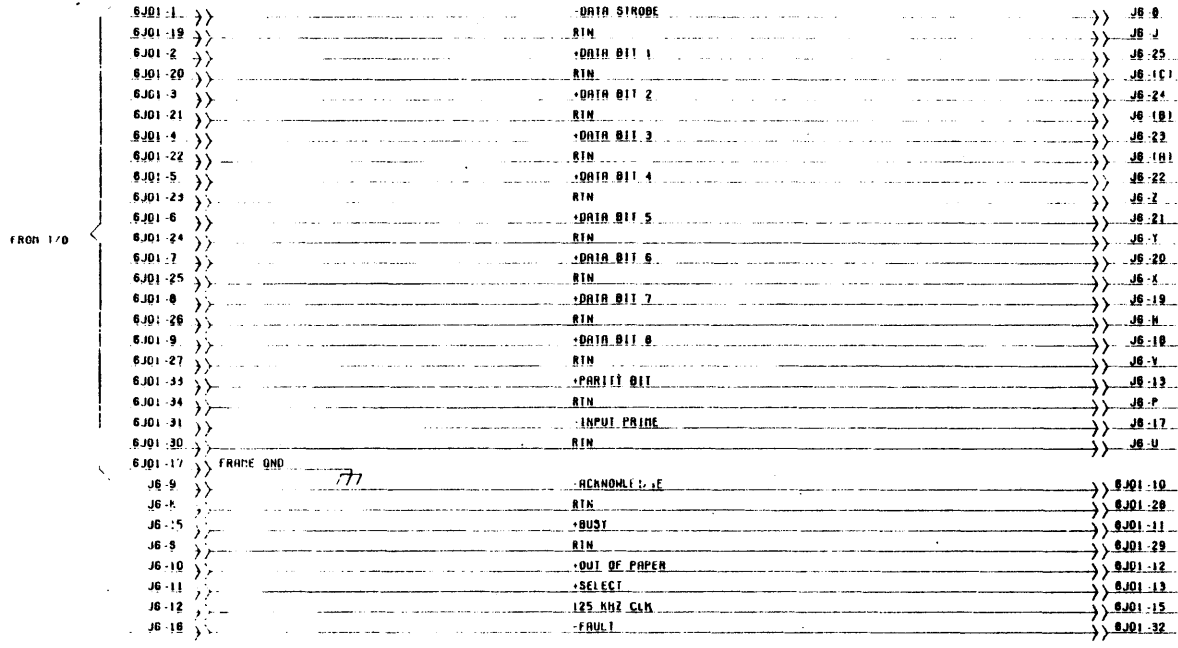
MODULE OUTPUTS

<u>MODULE CROSS REF. NO.</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
0701/J6-B	-DATA STROBE	0101/1PC1
0701/J6-J	RTN	
0701/J6-25	+DATA BIT 1	0102/1PC1
0701/J6-(C)	RTN	
0701/J6-24	+DATA BIT 2	0102/1PC1
0701/J6-(B)	RTN	
0701/J6-23	+DATA BIT 3	0102/1PC1
0701/J6-(A)	RTN	
0701/J6-22	+DATA BIT 4	0102/1PC1
0701/J6-Z	RTN	
0701/J6-21	+DATA BIT 5	0102/1PC1
0701/J6-Y	RTN	
0701/J6-20	+DATA BIT 6	0102/1PC1
0701/J6-X	RTN	
0701/J6-19	+DATA BIT 7	0102/1PC1
0701/J6-W	RTN	
0701/J6-18	+DATA BIT 8	0102/1PC1
0701/J6-V	RTN	
0701/J6-13	+PARITY BIT	0101/1PC1
0701/J6-P	RTN	
0701/J6-17	-INPUT PRIME	0102/1PC1
0701/J6-U	RTN	

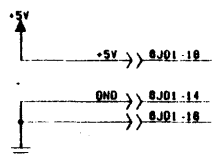
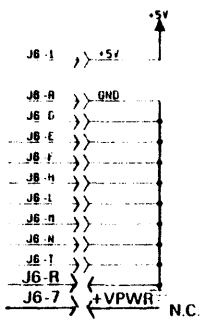
4 | 3 | 2 | 1

D
C
B
A

D
C
B
A



12-14

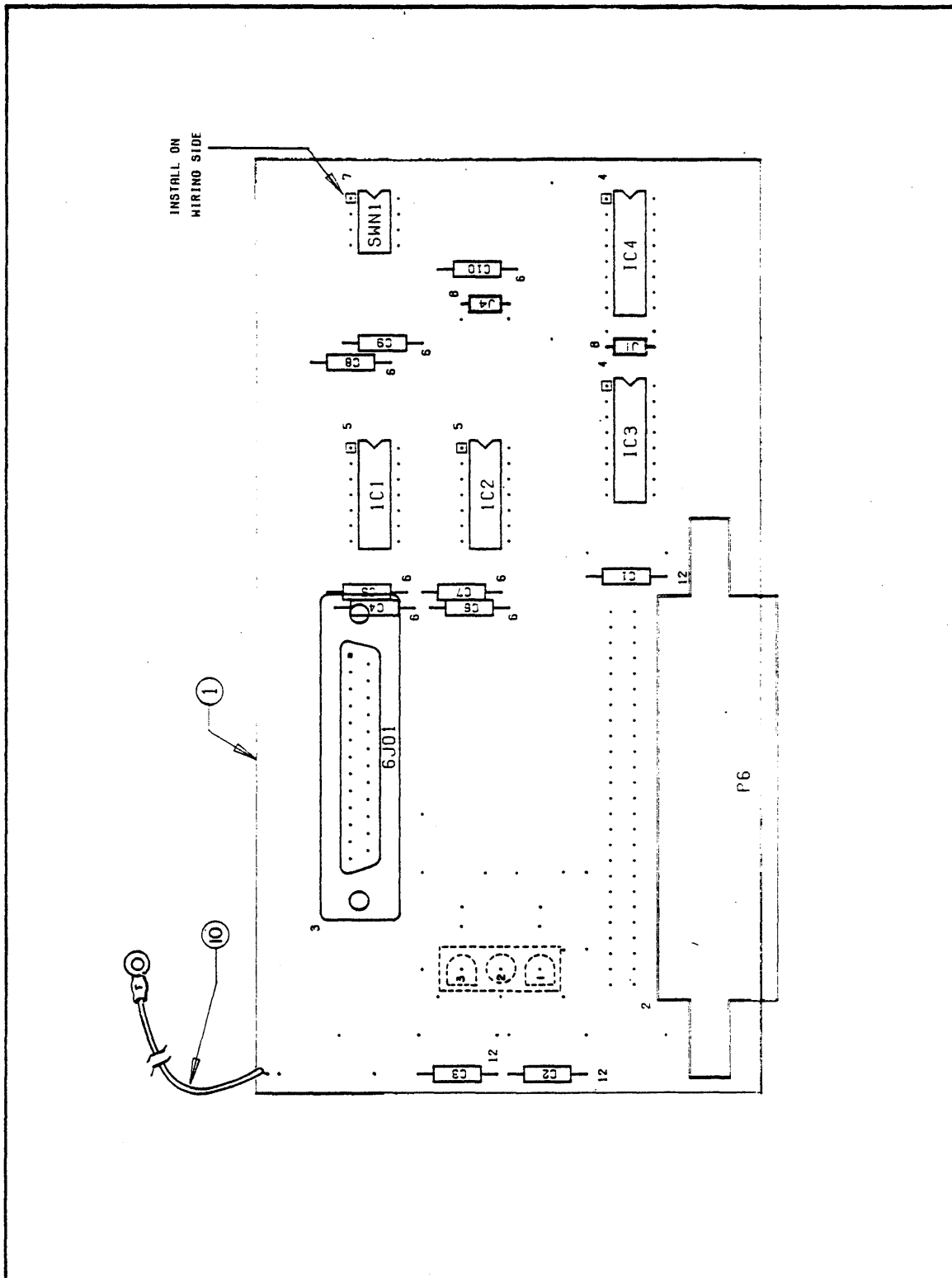


LOC. 6PCI
CROSS
REF. NO. 0701

1/O BOARD CENTRONICS PARALLEL		CODE IDENT C	DWG NO 44690608	REV B
6PCI	SHEET 3	CROSS REF NO 0701		

ES.360X.44690808.A07.3 1

4 | 3 | 2 | 1



I/O ADAPTOR - RS-232

CROSS REF NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44691260

PART NO: 44691261
REV: A
SHT: 02

MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
	12 VDC (+)	0701/P3-1
	12 VDC (-)	0701/P3-3
0102/1PC6	5 (+)	0701/P6-1
	COMMON	0701/P3-2
0103/1PC1	DTR (-)	0701/P6-2
1PC1	GND	0701/P6-C thru P6-Z
0102/1PC1	GND	0701/P6-(A)
0102/1PC1	GND	0701/P6-(B)
0102/1PC1	GND	0701/P6-(C)
0102/1PC6	GND	0701/P6-A
0102/1PC1	LOCAL LBK (-)	0701/P6-20
0102/1PC1	REM LBK (-)	0701/P6-24
0104/1PC1	REV CHAN (-)	0701/P6-3
0101/1PC1	RTS (-)	0701/P6-B
0103/1PC1	T DATA (+)	0701/P6-4
0102/1PC1	TEST OUT (-)	0701/P6-21

CROSS REF NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44691260

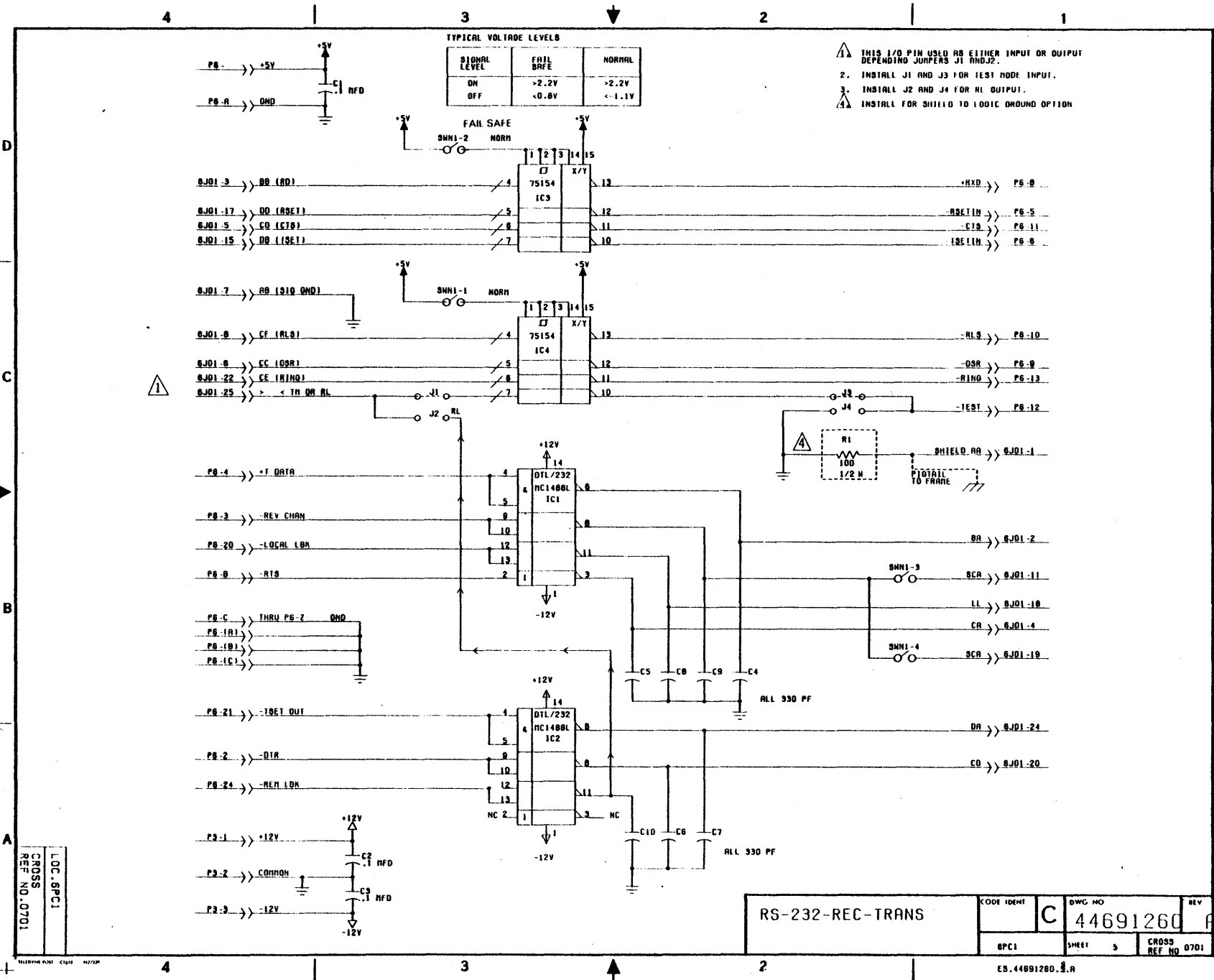
PART NO: 44691261
REV: A
SHT: 03

MODULE OUTPUTS

<u>MODULE CROSS REF NO.</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
0701/P6-11	CTS (-)	0101/1PC1
0701/P6-9	DSR (-)	0101/1PC1
0701/P6-5	R SET IN (-)	0103/1PC1
0701/P6-13	RING (-)	0101/1PC1
0701/P6-10	RLS (-)	0101/1PC1
4701/P6-8	RXD (+)	0101/1PC1
0701/P6-6	T SET IN (-)	0103/1PC1
0701/P6-12	TEST (-)	0101/1PC1

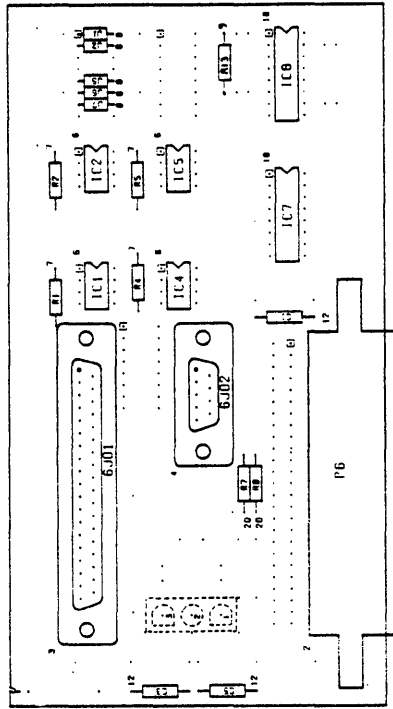
12-18

44691260

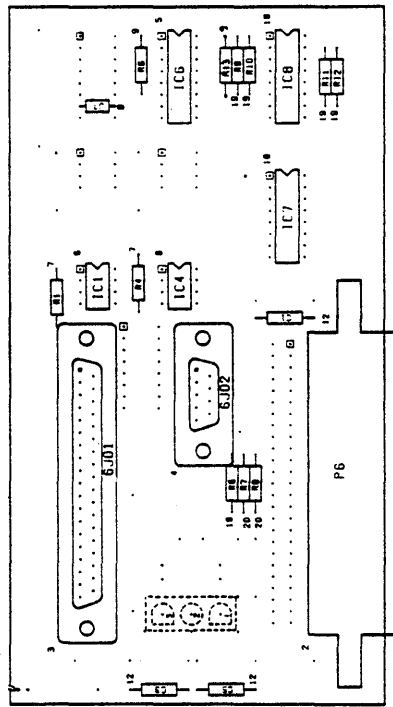


LOC. 8PC1
CROSS REF NO. 0701

RS-232-REC-TRANS		CODE IDENT	DWG NO	REV
		C	44691260	A
8PC1	SHEET 5	CROSS REF NO	0701	



RS-423



RS-422

I/O ADAPTOR - RS-422/RS-423

CROSS REF NO: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44689773

PART NO: 44689774
REV: B
DATE: 11-2-82
SHT: 2

LOGIC SIGNAL CROSS REF. DETACHED LIST

MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
0103/1PC1	-DTR	0701/P6-2
0103/1PC1	+TDATA	0701/P6-4
0102/1PC1	-T SET OUT	0701/P6-21
0103/1PC1	-RTS	0701/P6-8
0102/1PC1	-LOCAL LBK	0702/P6-20
0102/1PC1	-REM LBK	0702/P6-24
0104/1PC1	REV CHAN	0702/P6-3
0102/1PC6	+5V	0703/P6-1
0102/1PC6	GND	0703/P6-A
0101 THRU 0104/1PC1	GND	0703/P6-C THRU P6-Z
0102/1PC1	GND	0703/P6-(A)
0102/1PC1	GND	0703/P6-(B)
0102/1PC1	GND	0703/P6-(C)
	+12V	0703/P3-1
	COMMON	0703/P3-2
	-12V	0703/P3-3

CROSS REF NO: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44689773

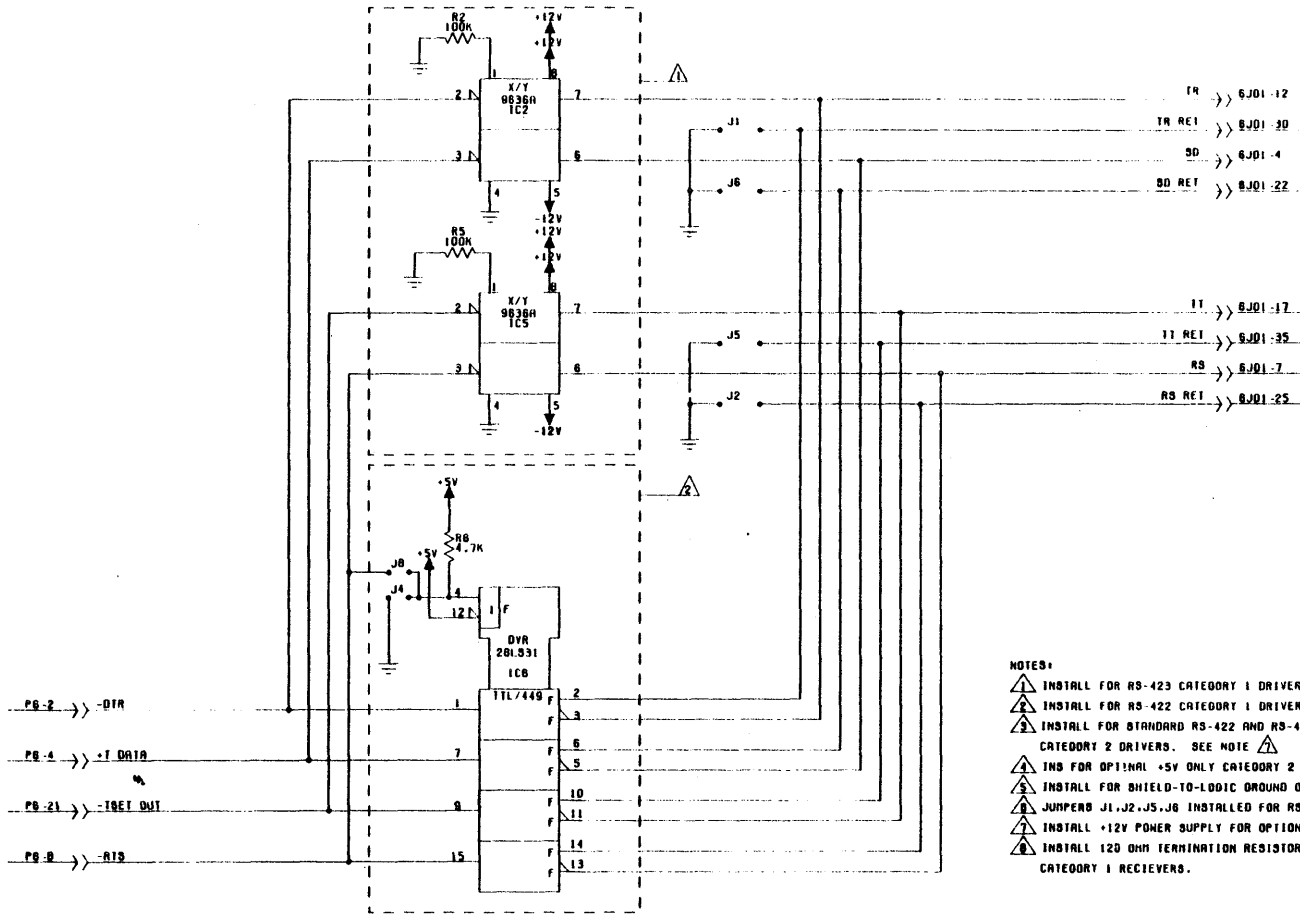
PART NO: 44689774
REV: B
DATE: 11-2-82
SHT: 3

LOGIC SIGNAL CROSS REF. DETACHED LIST

MODULE OUTPUTS

<u>MODULE CROSS REF. NO.</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
0703/P6-8	+RXD	0101/1PC1
0703/P6-5	-R SET IN	0103/1PC1
0703/P6-11	-CTS	0101/1PC1
0703/P6-6	-T SET IN	0104/1PC1
0703/P6-10	-RLS	0101/1PC1
0703/P6-9	-DSR	0101/1PC1
0703/P6-13	-RING	0101/1PC1
0703/P6-12	-TEST	0101/1PC1

12-22



- NOTES:
- ▲ INSTALL FOR RS-423 CATEGORY 1 DRIVERS. SEE NOTE ▲
 - ▲ INSTALL FOR RS-422 CATEGORY 1 DRIVERS
 - ▲ INSTALL FOR STANDARD RS-422 AND RS-423 CATEGORY 2 DRIVERS. SEE NOTE ▲
 - ▲ INS FOR OPTIONAL +5V ONLY CATEGORY 2 DRIVERS
 - ▲ INSTALL FOR SHIELD-TO-LOGIC DROUND OPTION
 - ▲ JUMPERS J1, J2, J5, J6 INSTALLED FOR RS-423 CATEGORY 1 DRIVERS.
 - ▲ INSTALL +12V POWER SUPPLY FOR OPTIONS ▲ AND ▲ ABOVE
 - ▲ INSTALL 120 OHM TERMINATION RESISTORS FOR RS-422 CATEGORY 1 RECEIVERS.

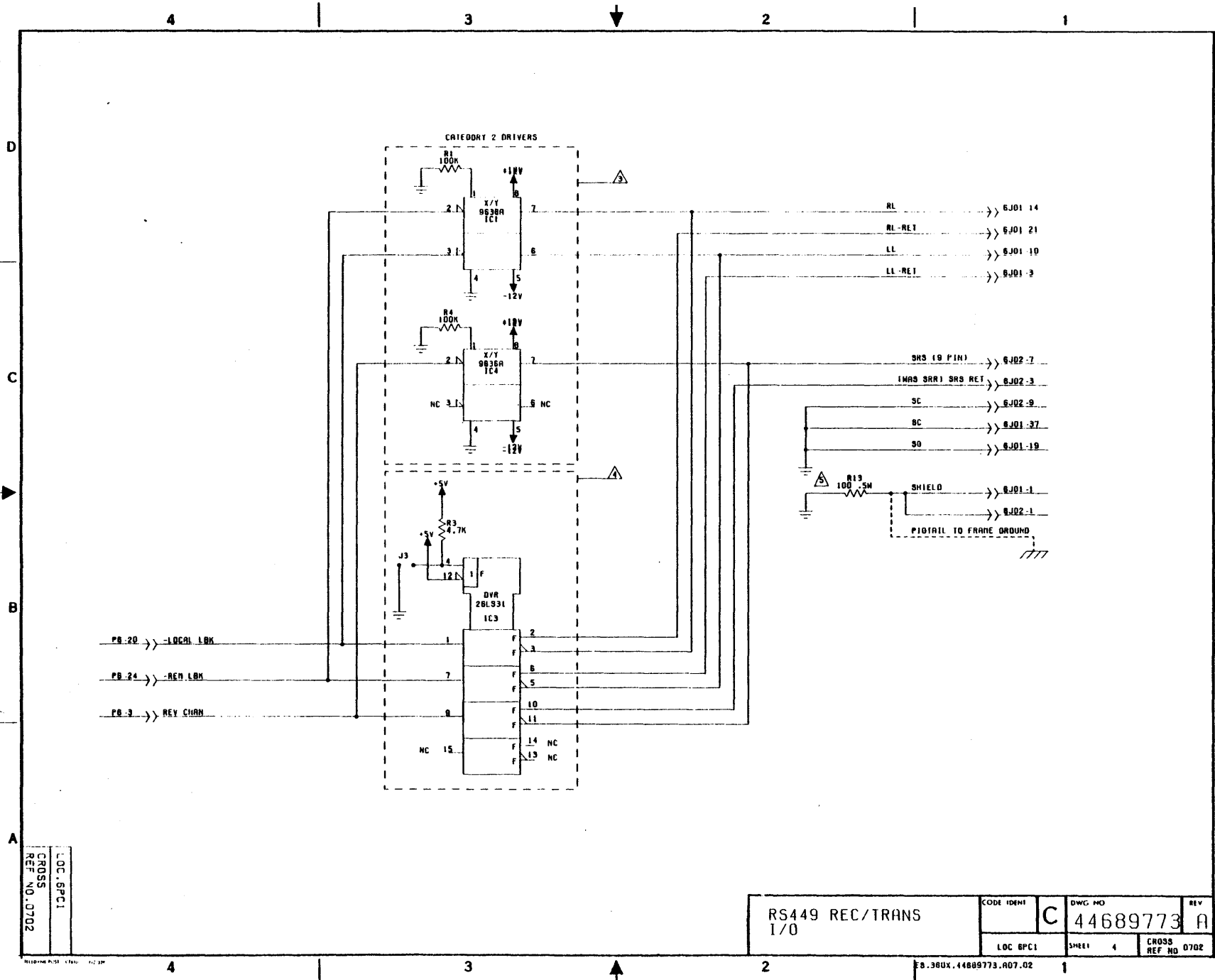
LOC: 8PC1
CROSS
REF: NO. 0701

RS449 REC/TRANS I/O		CODE IDENT	DWG NO C 44689773	REV A
LOC 8PC1	SHEET 3	CROSS REF NO 0701		

ES.380X.44689773.A07.01

44689773

12-23



LOC. 6PCI
 CROSS
 REF. NO. 0702

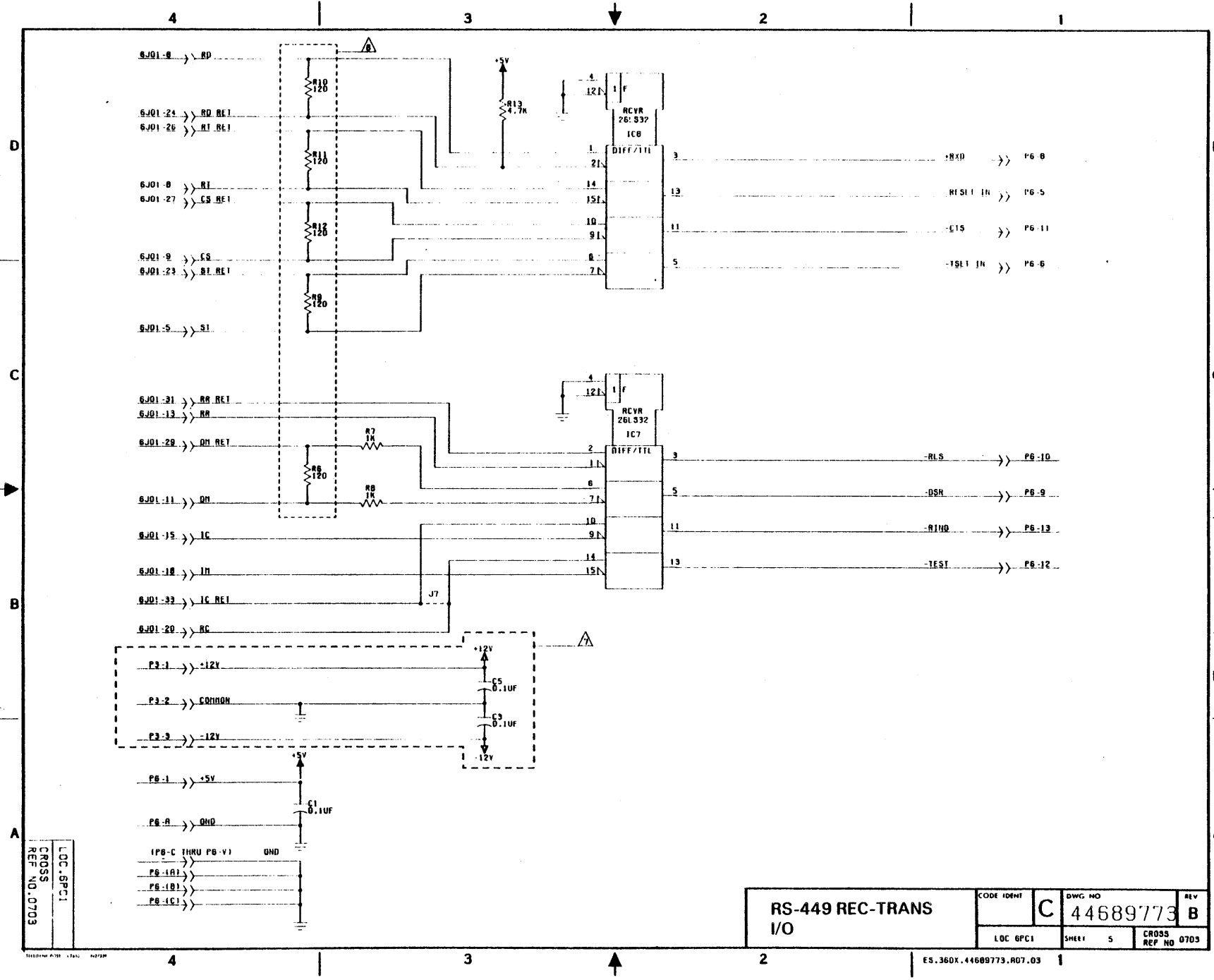
RS449 REC/TRANS
 I/O

CODE IDENT	C	DWG NO	44689773	REV	A
LOC 6PCI	SHEET	4	CROSS REF NO	0702	

REVISION A-51 1/20 12/23

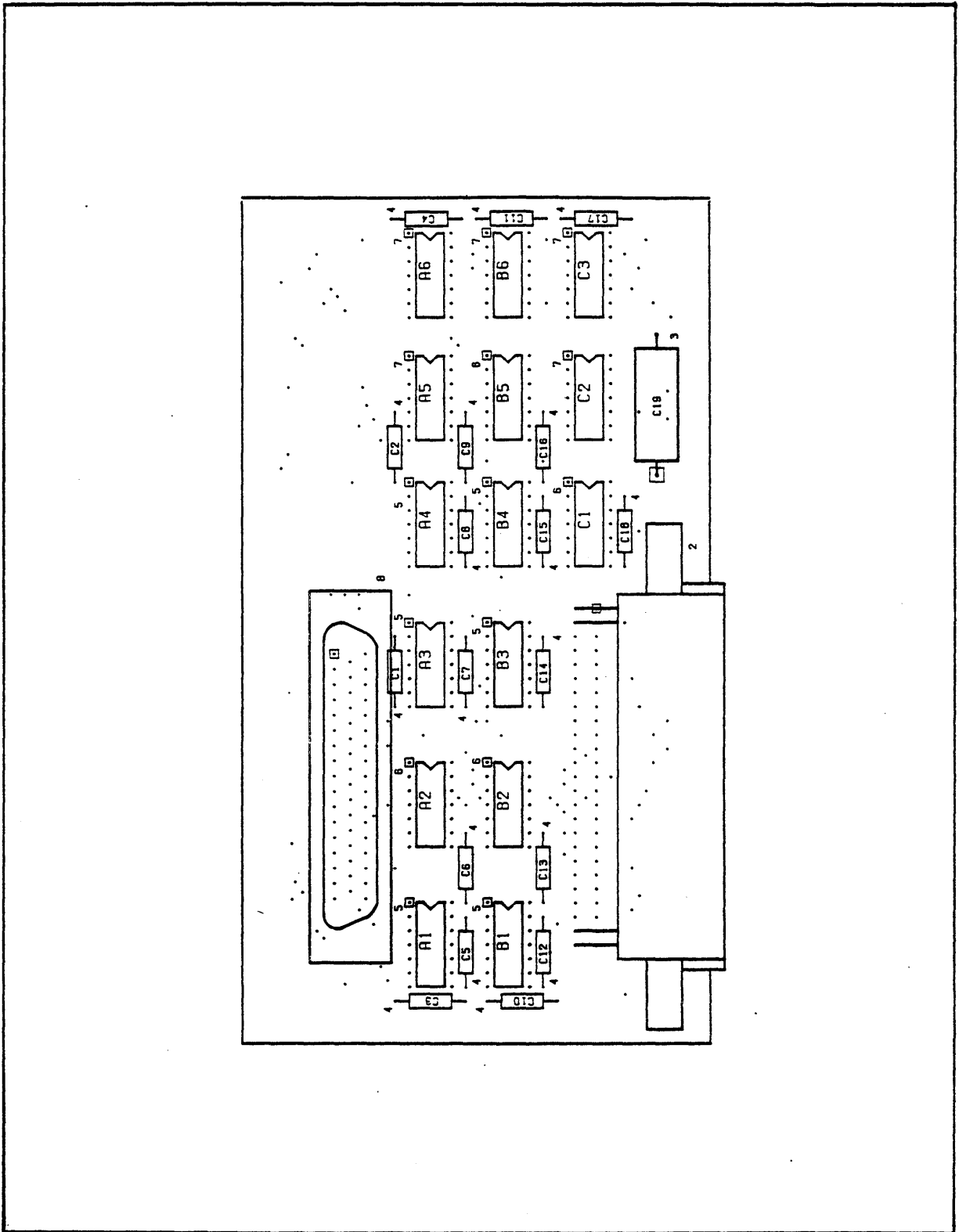
ES.380X.44689773.A07.02

12-24



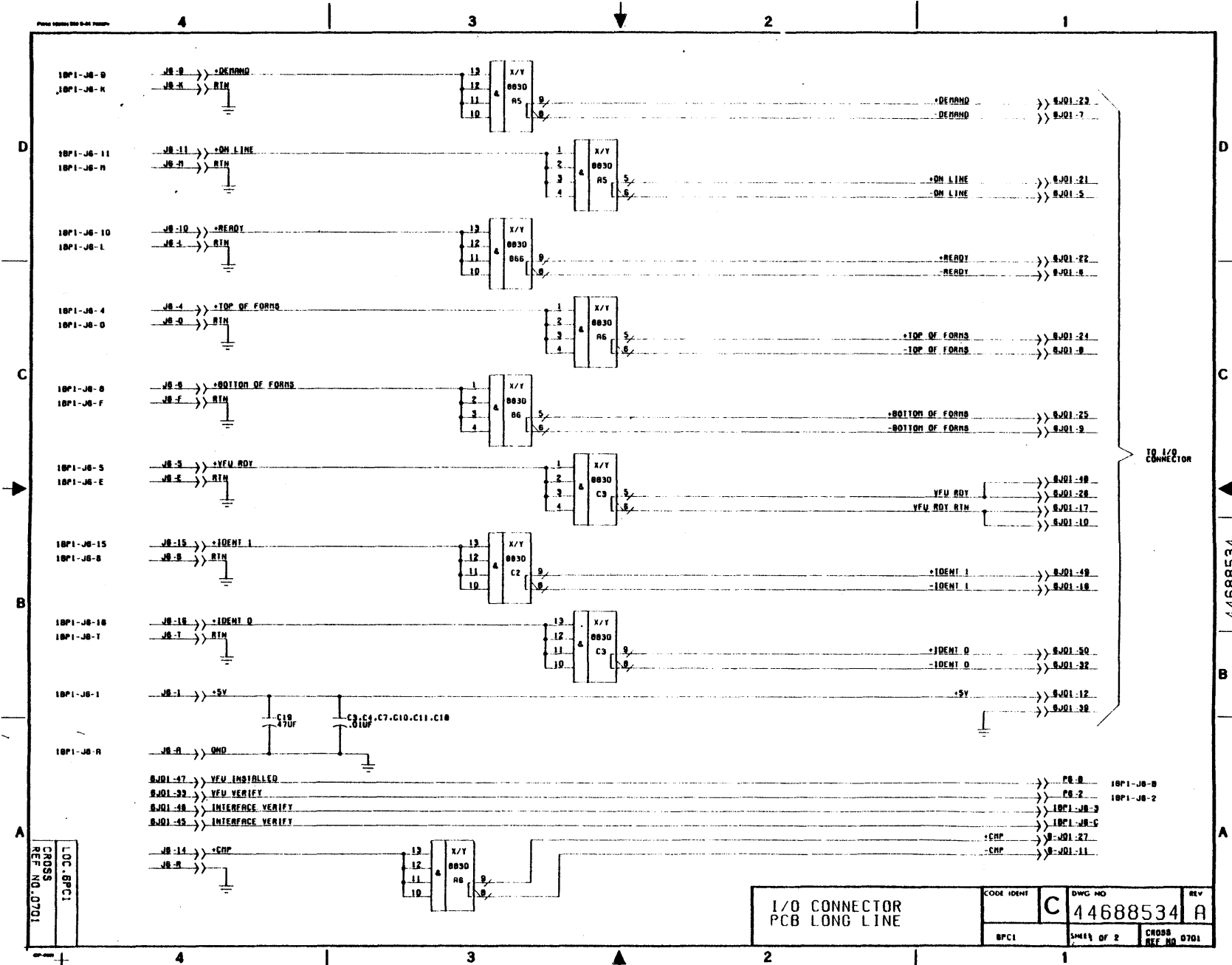
LOC:SPC1
 CROSS
 REF NO: 0703

RS-449 REC-TRANS I/O		CODE IDENT	DWG NO	REV
			C 44689773	B
LOC GPC1	SHEET	5	CROSS REF NO	0703



I/O ADAPTOR - D TYPE, LONG LINE

12-26



LOC: BPC1
CROSS REF. NO. 0701

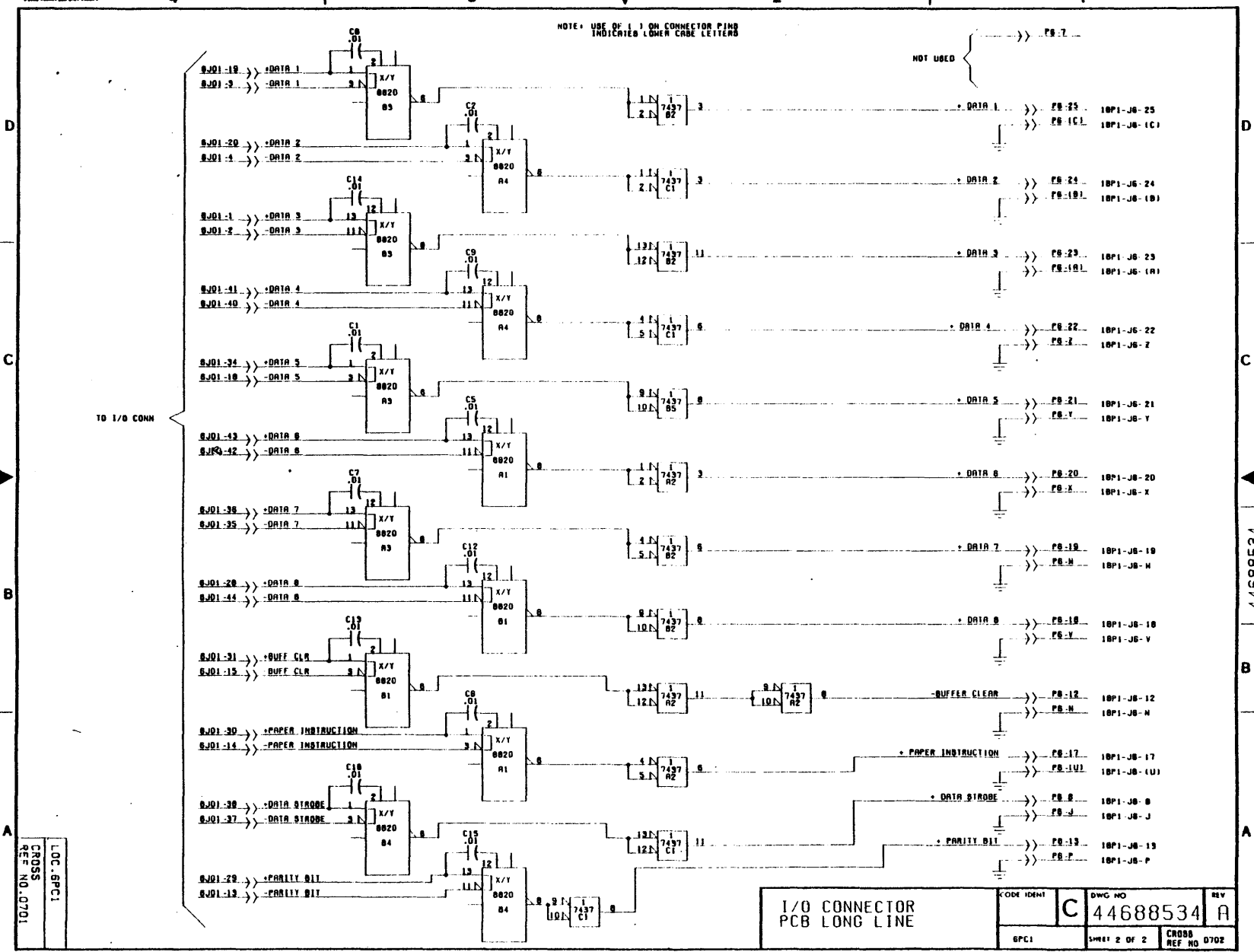
I/O CONNECTOR PCB LONG LINE		CODE IDENT C	DWG NO 44688534	REV A
BPC1	SHEET OF 2	CROSS REF. NO. 0701		

44688534

FORM NO. 617-1 (REV. 11-63)

NOTE: USE OF 1, 1 ON CONNECTOR PINS INDICATED LOWER CASE LETTERS

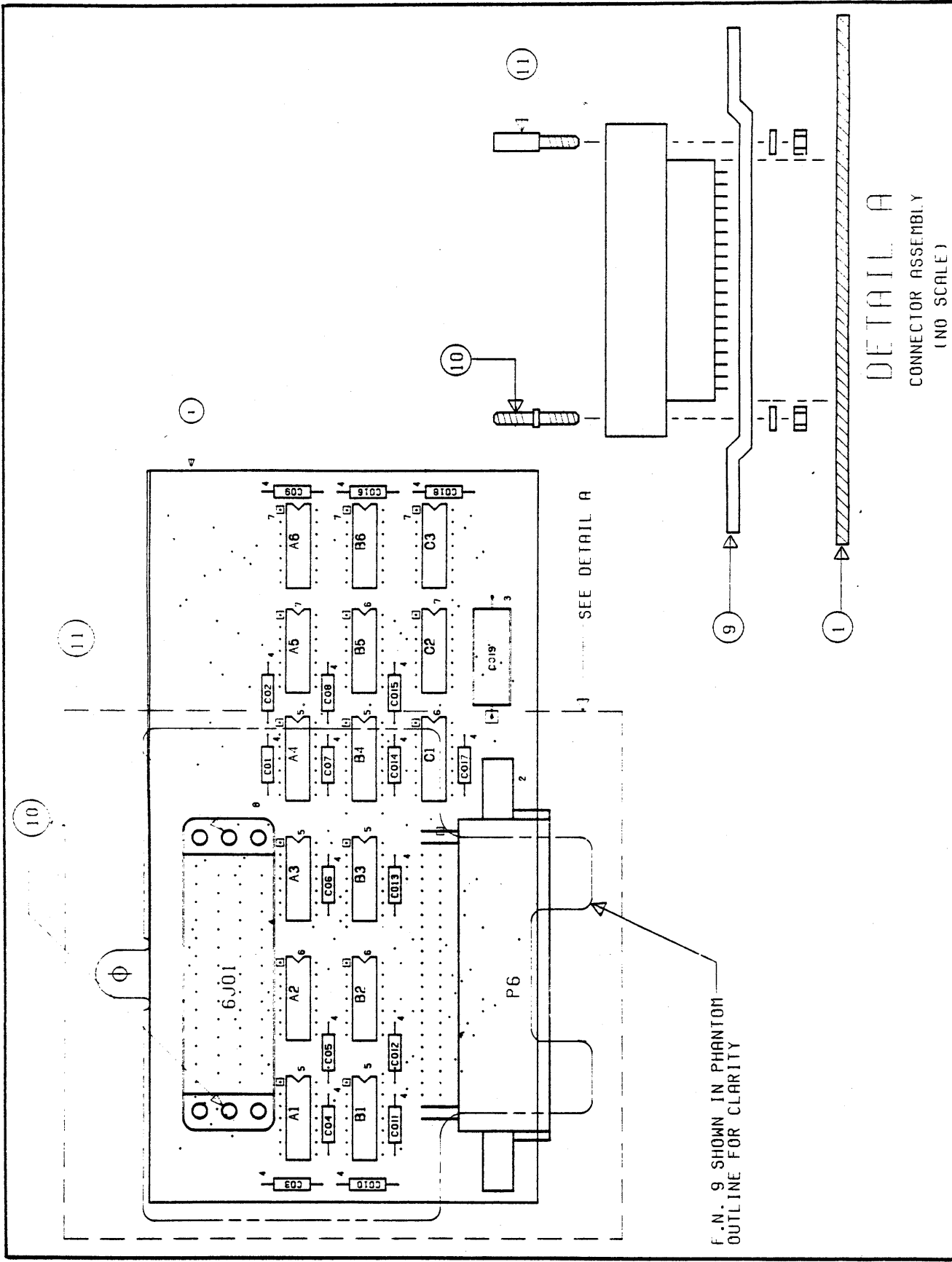
NOT USED



12-27

44688534

CODE IDENT	C	DWG NO	44688534	REV	A
6PC1		SHEET	2 OF 2	CROSS REF NO	0702



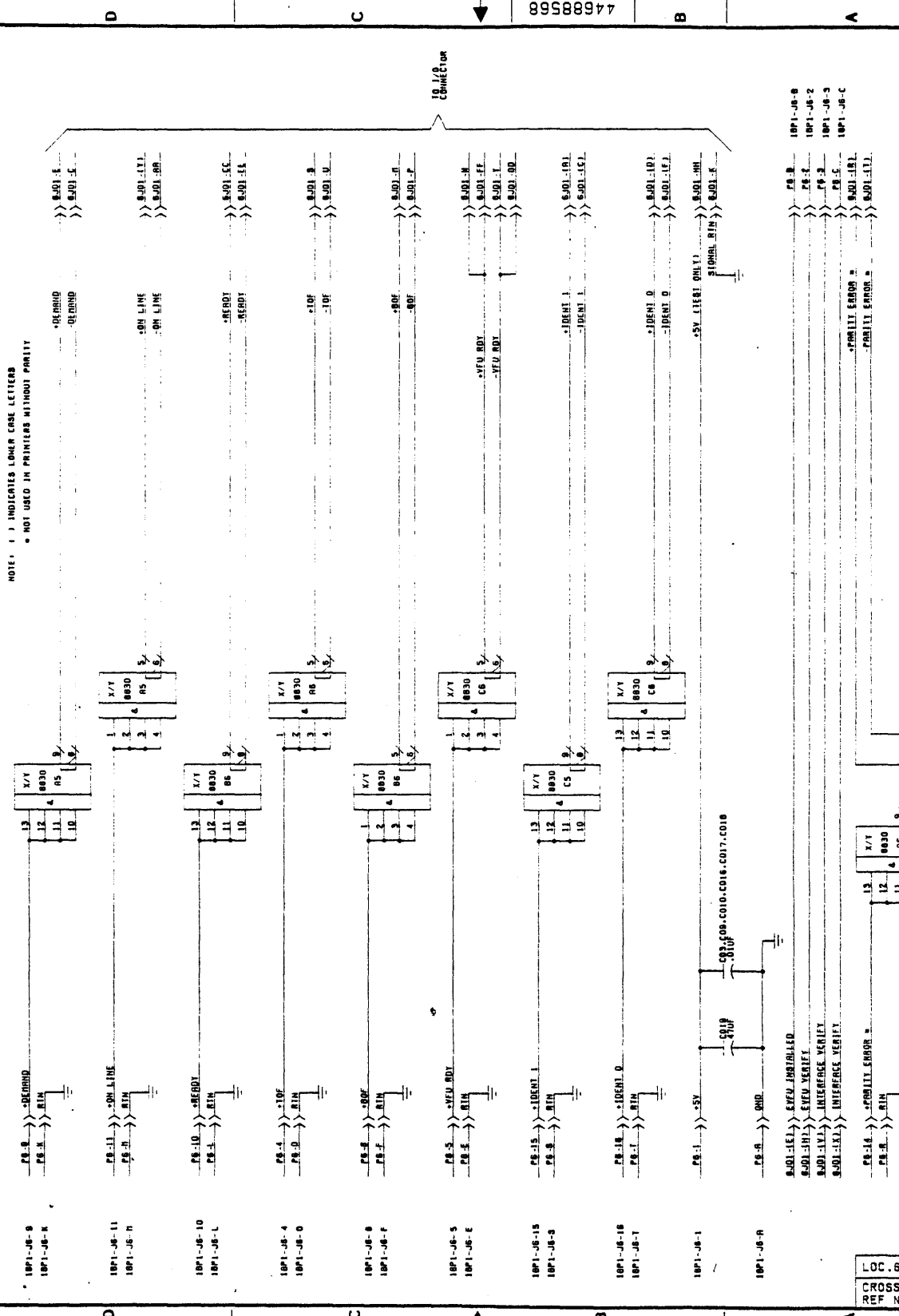
F.N. 9 SHOWN IN PHANTOM
OUTLINE FOR CLARITY

DETAIL A
CONNECTOR ASSEMBLY
(NO SCALE)

I/O ADAPTOR - WINCHESTER TYPE LONG-LINE

4 3 2 1

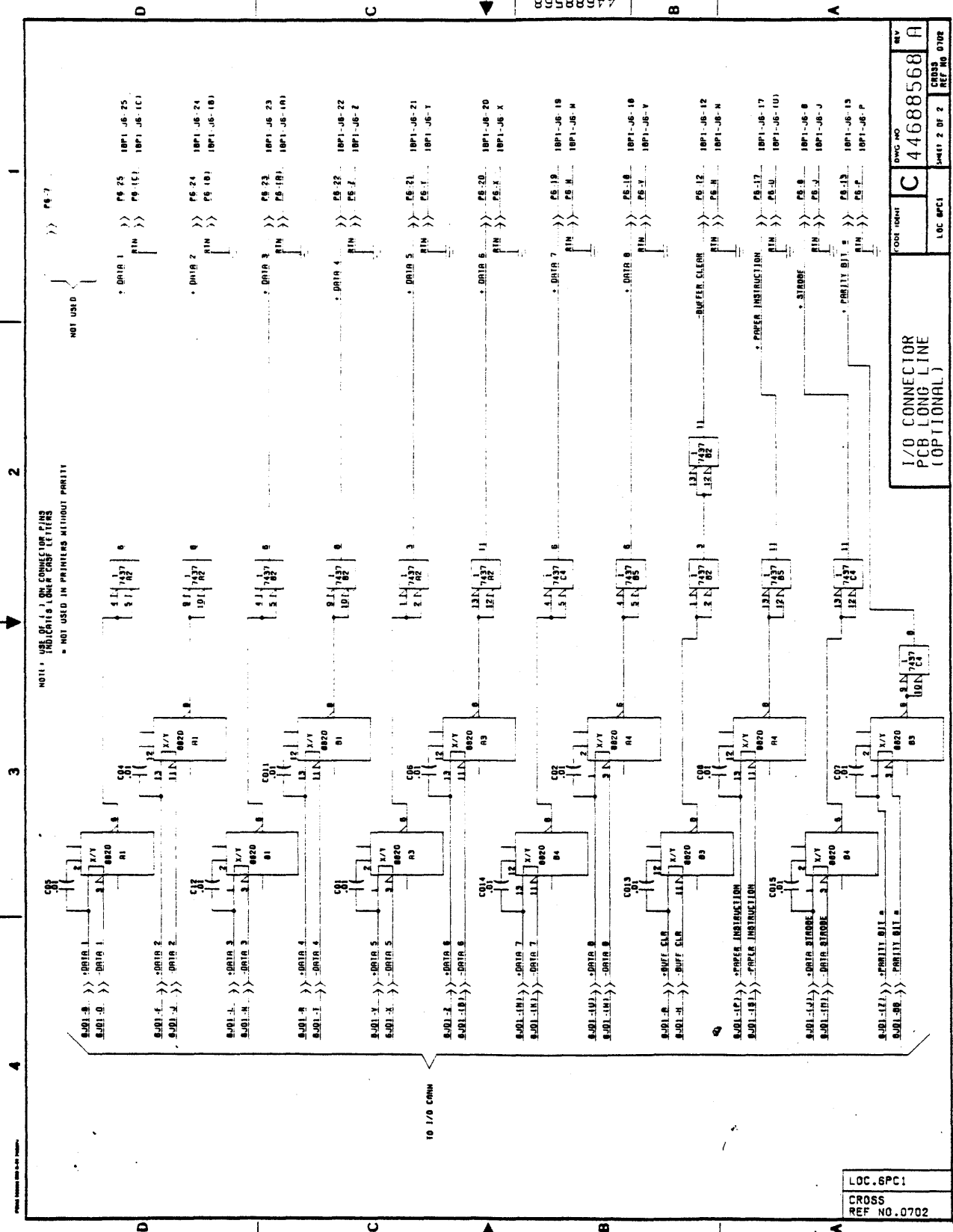
NOTE: () INDICATES LOWER CASE LETTERS
 * NOT USED IN PRINTERS WITHOUT PARITY



I/O CONNECTOR PCB LONG LINE OPTIONAL		CUR. LIMIT	LOC. OPT	SHEET OF 2	REV
44688568		C			A

LOC. 6PC1
 CROSS
 REF NO. 0701

44688568



NOTICE: USE OF I/O CONNECTOR PINS INDICATED LOWER CASE LETTERS - NOT USED IN PRINTERS WITHOUT PARITY

LOC. 6PC1
CROSS REF NO. 0702

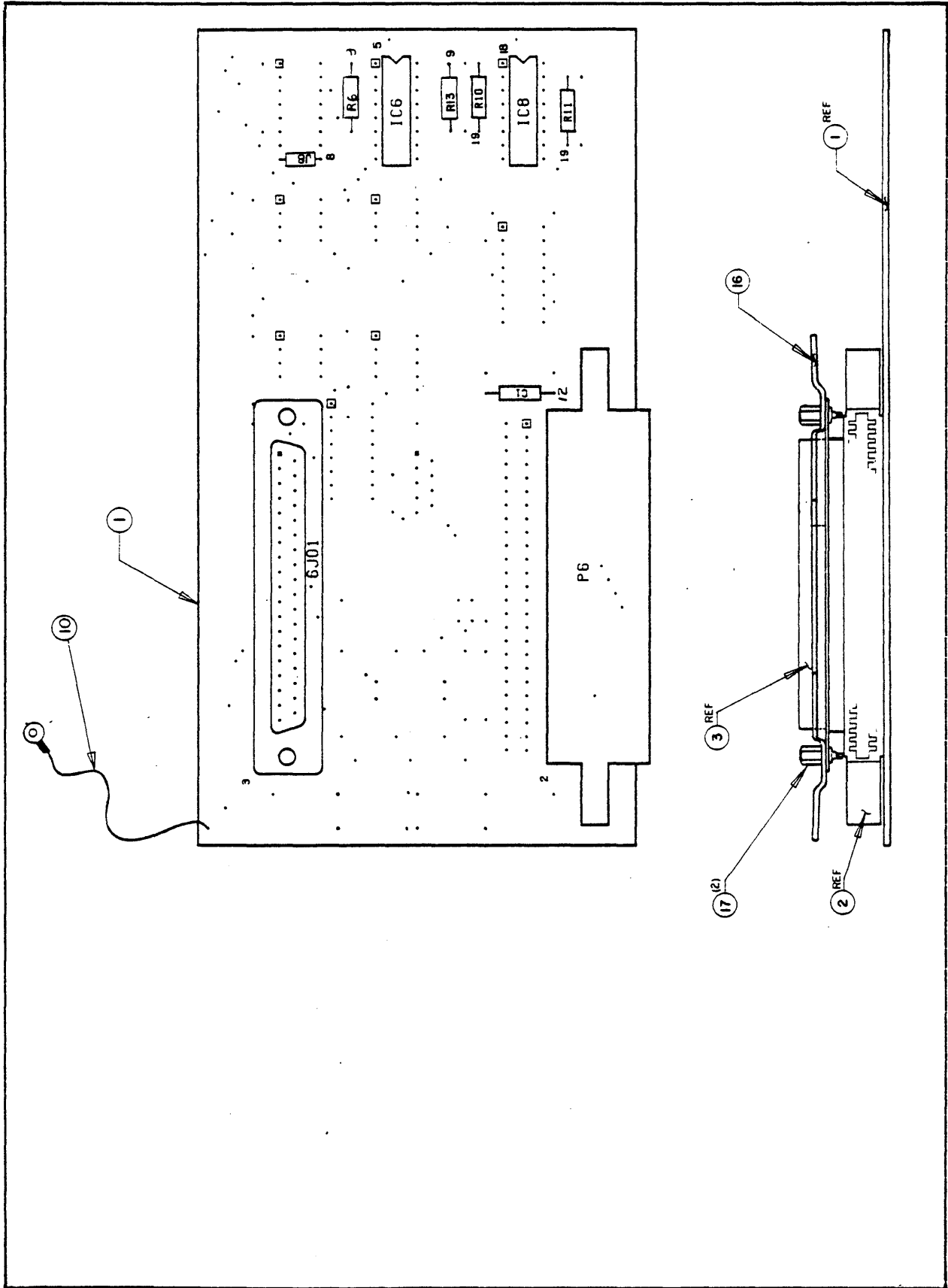
LOC. 6PC1
CROSS REF NO. 0702

LOC. 6PC1
CROSS REF NO. 0702

LOC. 6PC1
CROSS REF NO. 0702

I/O CONNECTOR
PCB LONG LINE
(OPTIONAL)

DWG NO. C 44688568 A
REV. 1
CROSS REF NO. 0702



I/O ADAPTOR - SERIES I

CROSS REF. NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44690623

PART NO: 44690624
REV: 8
DATE: 3-1-83
SHT: 2

LOGIC SIGNAL CROSS REF. DETACHED LIST
MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
0103/1PC1	-DTR	0701/P6-2
0104/1PC1	+T DATA	0701/P6-4
0102/1PC1	-T SET OUT	0701/P6-21
0101/1PC1	-RTS	0701/P6-B
	+5V	0701/P6-1
	GND	0701/P6-A
	GND	0701/P6- [C thru
	GND	P6- (A)] P6-Z
	GND	P6- (B)
	GND	P6- (C)

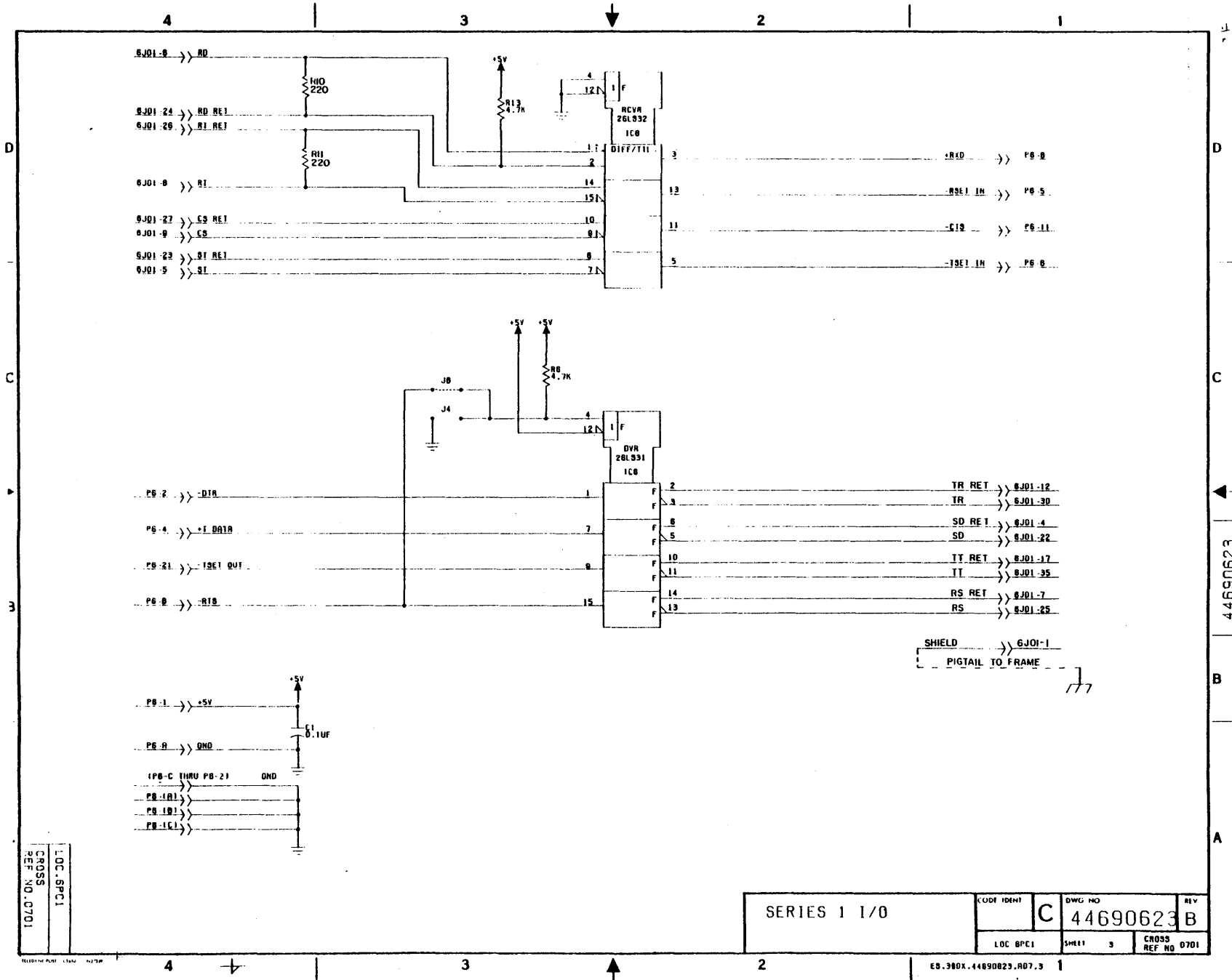
CROSS REF. NO.: 0700
MODULE LOC: 6PC1
SCHEMATIC NO: 44690623

PART NO: 44690624
REV: 8
DATE: 3-1-83
SHT: 2

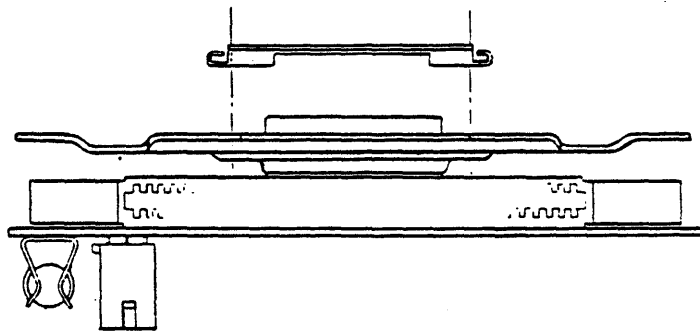
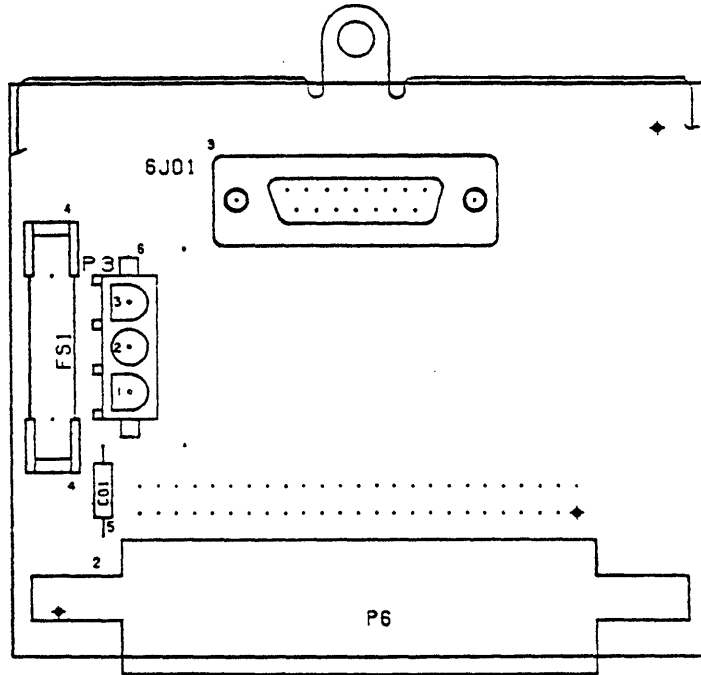
MODULE OUTPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
0701/P6-8	+RXD	0101/1PC1
0701/P6-5	-RSET IN	0103/1PC1
0701/P6-11	-CTS	0101/1PC1
0701/P6-6	-TSET IN	0103/1PC1

12-33 / 12-34

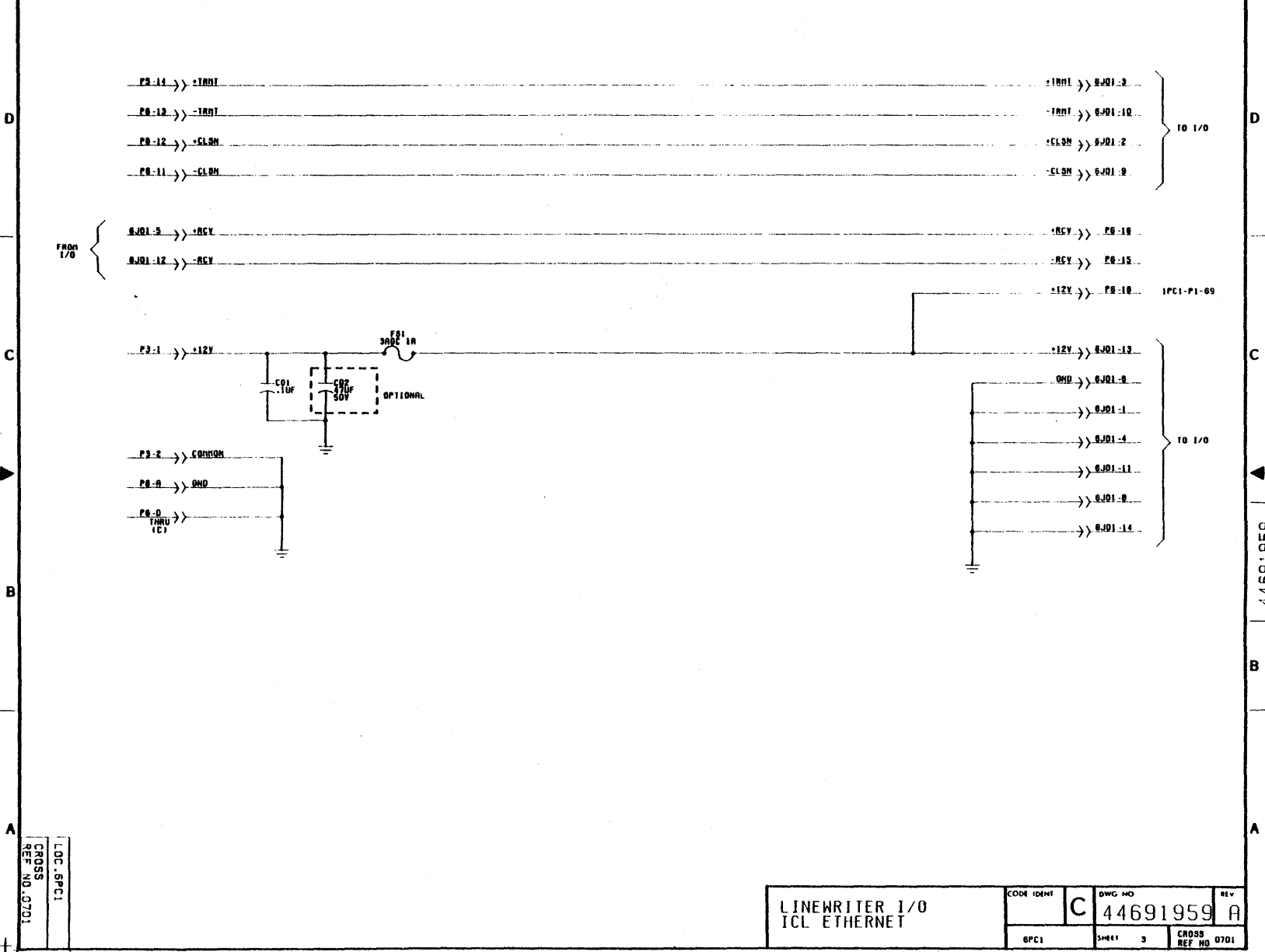


44690623



I/O ADAPTOR - ETHERNET

4 | 3 | 2 | 1



LOC: 6PC1
 CROSS
 REF NO: 0701

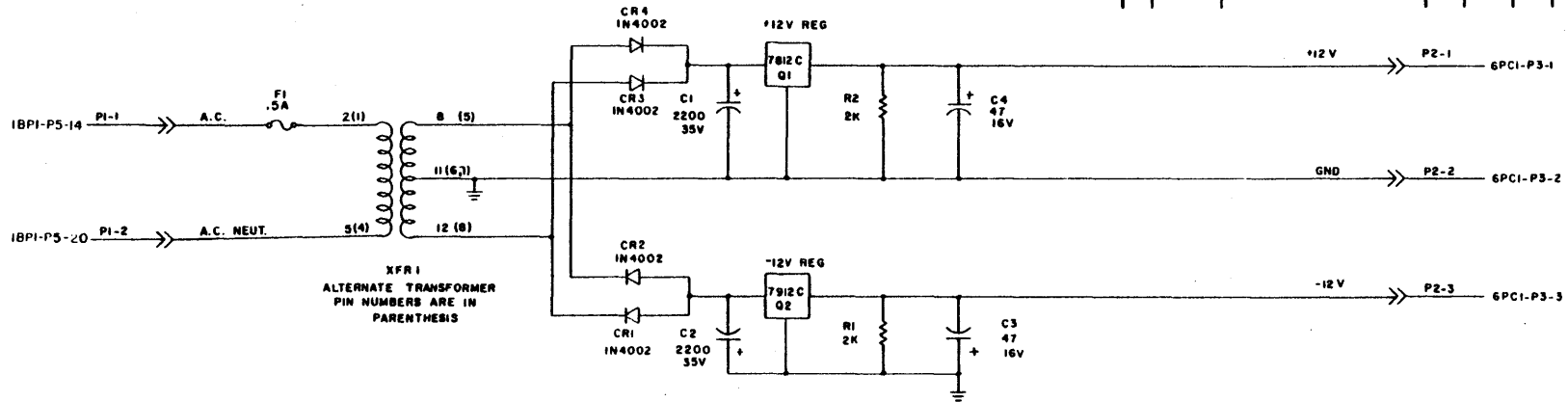
LINEWRITER I/O ICL ETHERNET	CODE IDENT	DWG NO	REV
	6PC1	C 44691959	A
	SHEET 3	CROSS REF NO 0701	

12-36

44691959

SHEET REVISION STATUS				
REV	ECO	DESCRIPTION	DRFT	APP

REVISION RECORD				
REV	ECO	DESCRIPTION	DRFT	APP
	PH19283		CAL	



XFRI
ALTERNATE TRANSFORMER
PIN NUMBERS ARE IN
PARENTHESES

TITLE		
+12V/-12V PWR SUPPLY LOGIC		
CODE IDENT	DRAWING NO	
31917	C	44690463
SCALE 4PC2	SHEET	1 OF 1

LOC. 4PC2
CROSS REF. 1100

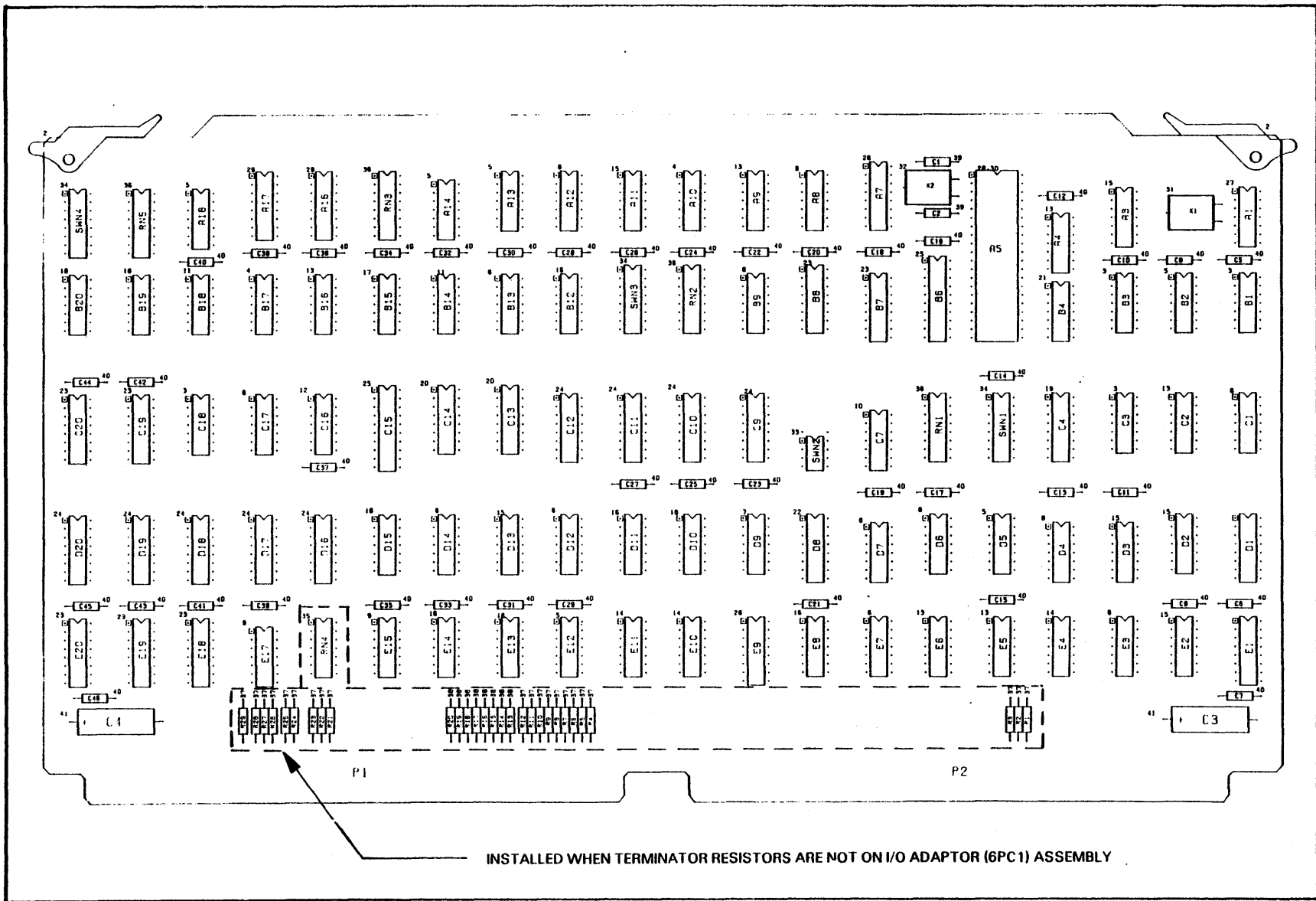
12-38

JAN, '85

44690463

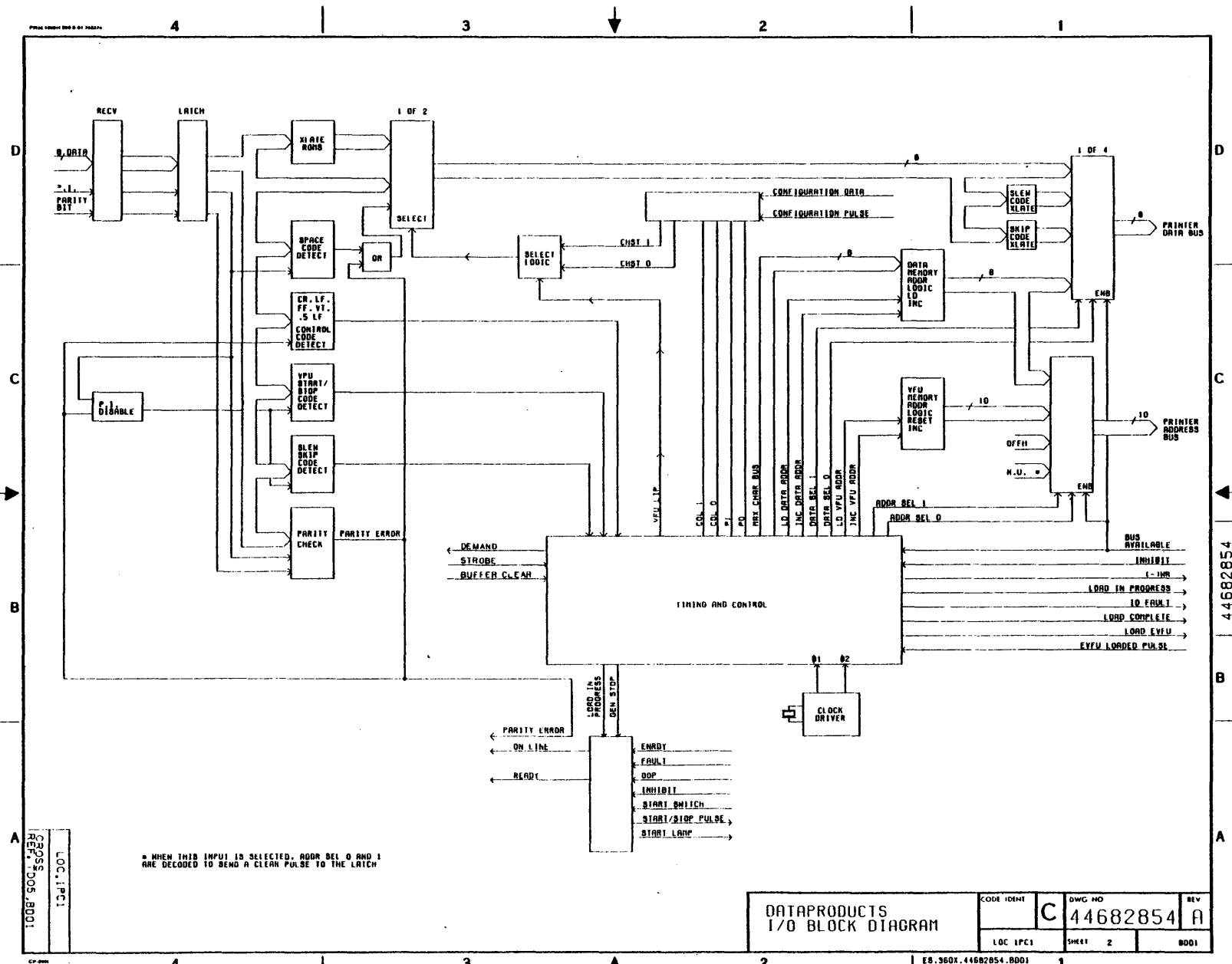
SECTION XIII LOGIC DIAGRAMS - PERSONALITY MODULES

Data Products Compatible Parallel Interface Personality Module	13-2
RS-232/Series 1 Serial Interface Personality Module	13-24
Centronics Parallel Interface Personality Module	13-39



DATA PRODUCTS COMPATIBLE PARALLEL INTERFACE PERSONALITY MODULE

13-3

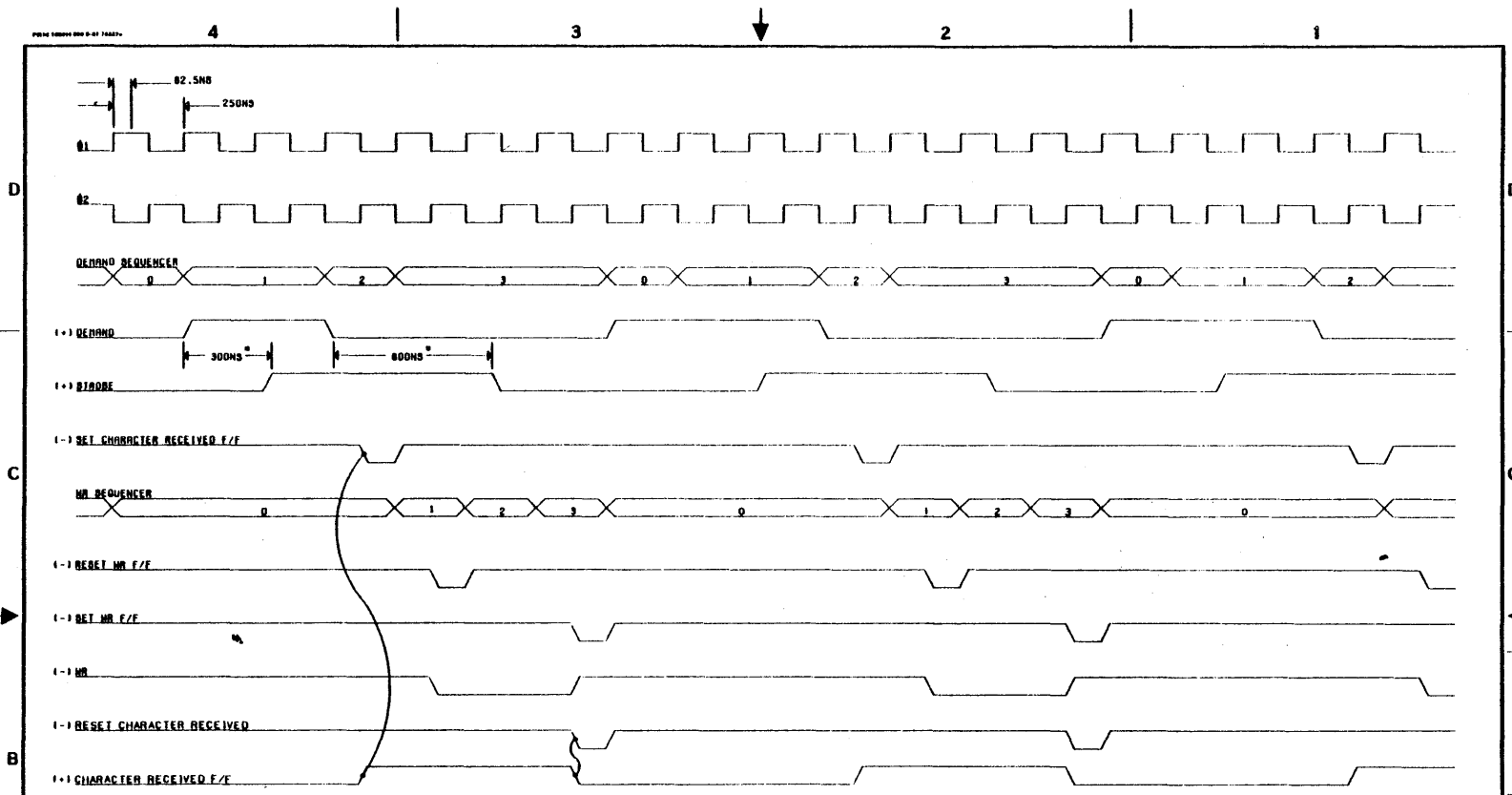


LOC. 1PC1
 REV. 1005, 8001

WHEN THIS INPUT IS SELECTED, ADDR SEL 0 AND 1 ARE DECODED TO SEND A CLEAR PULSE TO THE LATCH

DATAPRODUCTS I/O BLOCK DIAGRAM		CODE IDENT C	DWG NO 44682854	REV A
LOC 1PC1	SHEET 2	8001		

44682854



-TIMING FROM B300 INTERFACE DIAGRAM.

DEMAND SEQUENCER		WR SEQUENCER	
STATE	DESCRIPTION	STATE	DESCRIPTION
00	INSURE DEMAND 0 THEN WAIT FOR ENAB E	00	REQUEST CHARACTER AND WAIT FOR CHARACTER RECEIVED AND SOCC
01	RAISE DEMAND AND WAIT FOR STROBE	01	REBEL (-)WR F/F
10	DROP DEMAND AND SET CHARACTER RECEIVED F/F	10	NOP
11	WAIT FOR CHARACTER ACK AND WAIT FOR DATA SOURCE TO DROP STROBE	11	SET (-)WR F/F AND REBEL CHARACTER RECEIVED F/F THIS PULSE ALSO INCREMENTS THE

NOTE: CHARACTER ACK IS (-) CHARACTER RECEIVED F/F

18-4

44682854

LOC 1PC1
CROSS
REF NO. 1001

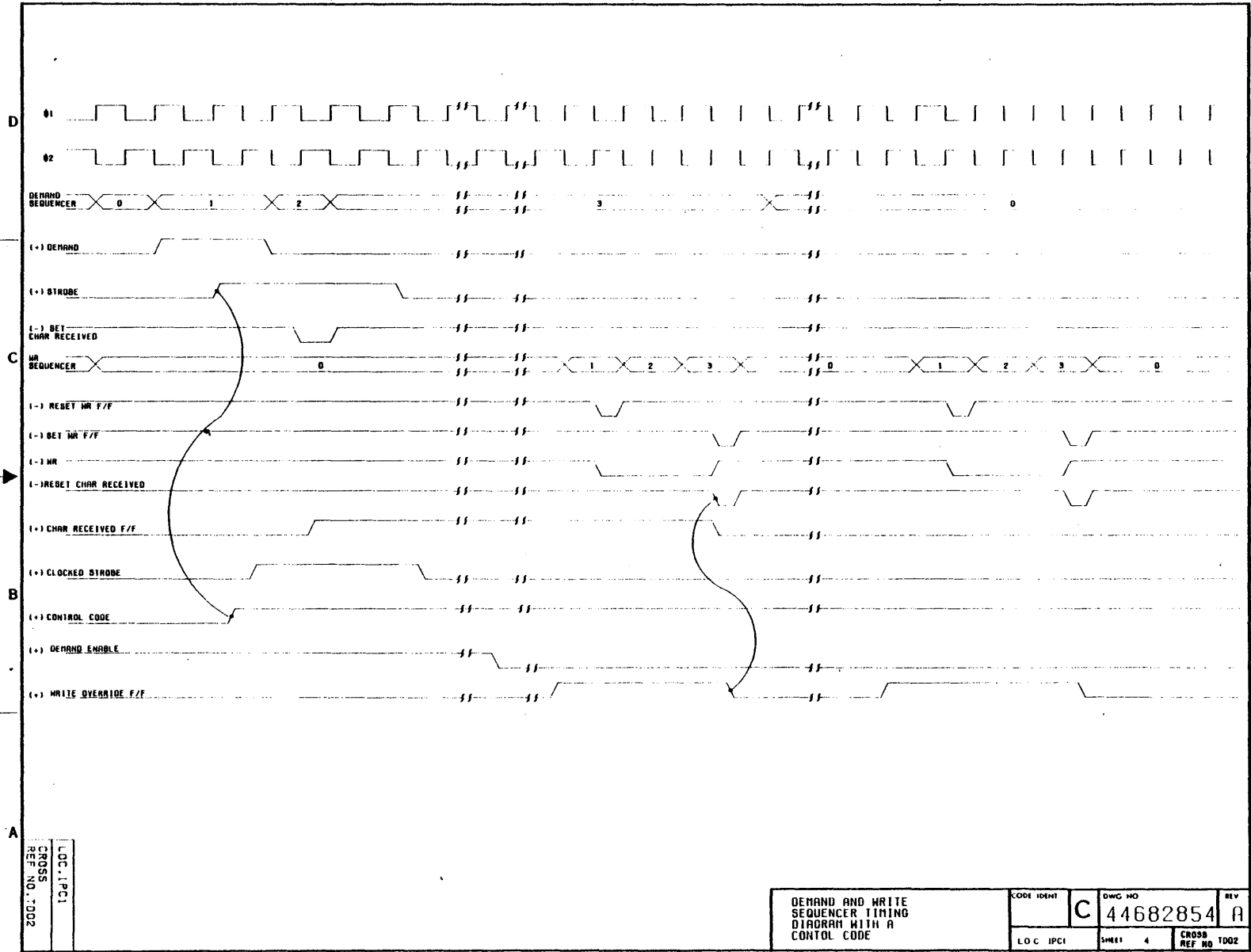
DEMAND AND WRITE SEQUENCER TIMING DIAGRAM		CODE IDENT	C	DWG NO	44682854	REV	A
LOC 1PC1	SHEET	3	CROSS REF NO	1001			

4

3

2

1



18-5

44682854

LOC: IPC1
 CROSS
 REF NO: 1002

DEMAND AND WRITE SEQUENCER TIMING DIAGRAM WITH A CONTROL CODE		CODE IDENT	DWG NO	REV
			C 44682854	A
LOC: IPC1	SHEET 4	CROSS REF NO 1002		

4

3

2

1

4

3

2

1

D

C

B

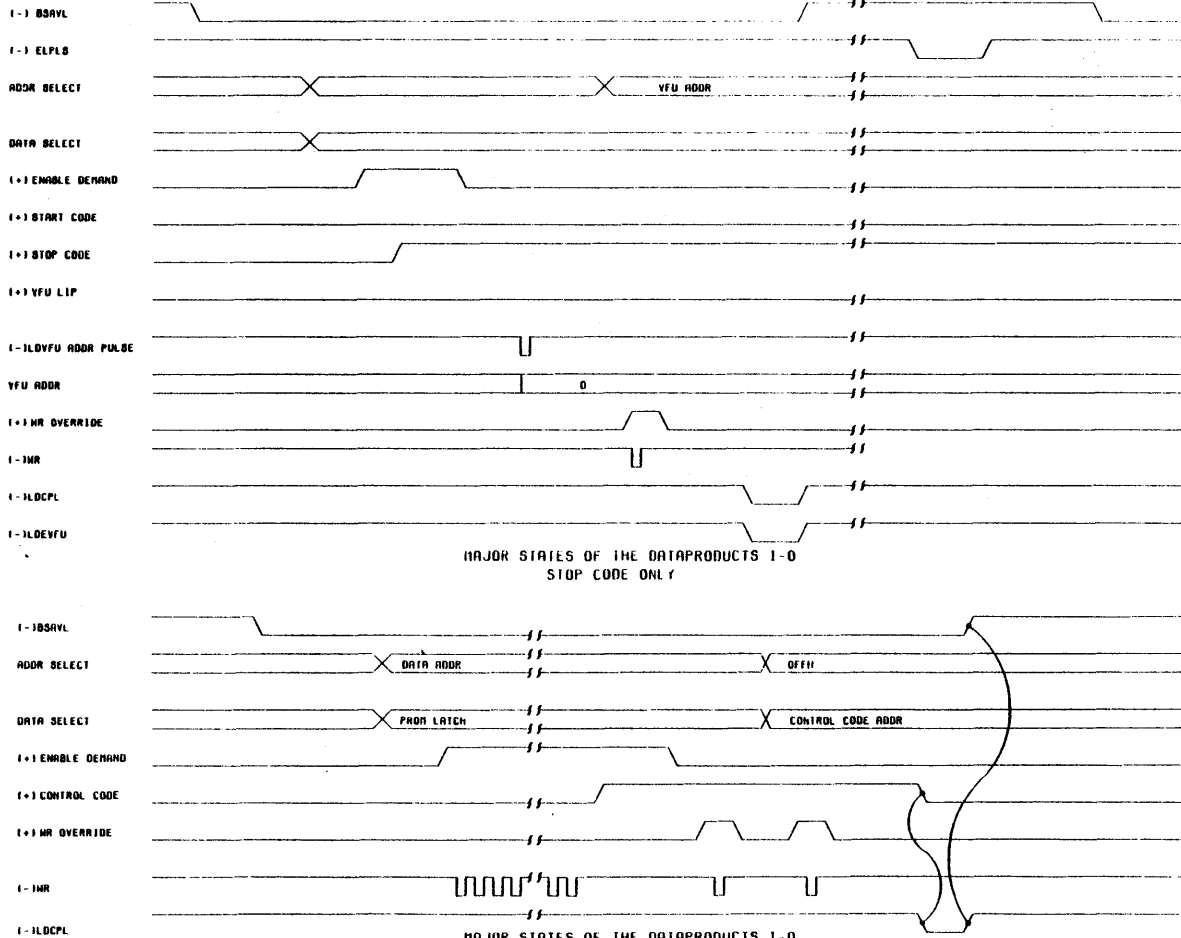
A

D

C

B

A



MAJOR STATES OF THE DATAPRODUCTS 1-0
STOP CODE ONLY

MAJOR STATES OF THE DATAPRODUCTS 1-0
- TYPICAL PRINT LINE BUFFER LOAD-

13-6

44682854

LOC: IPCI
CROSS
REF NO. 1003

-STOP CODE ONLY-
AND
TYPICAL PLB LOAD
TIMING DIAGRAMS

CODE IDENT	C	DWG NO	44682854	REV	A
LOC IPCI	SHEET	5	CROSS REF NO	1003	

4

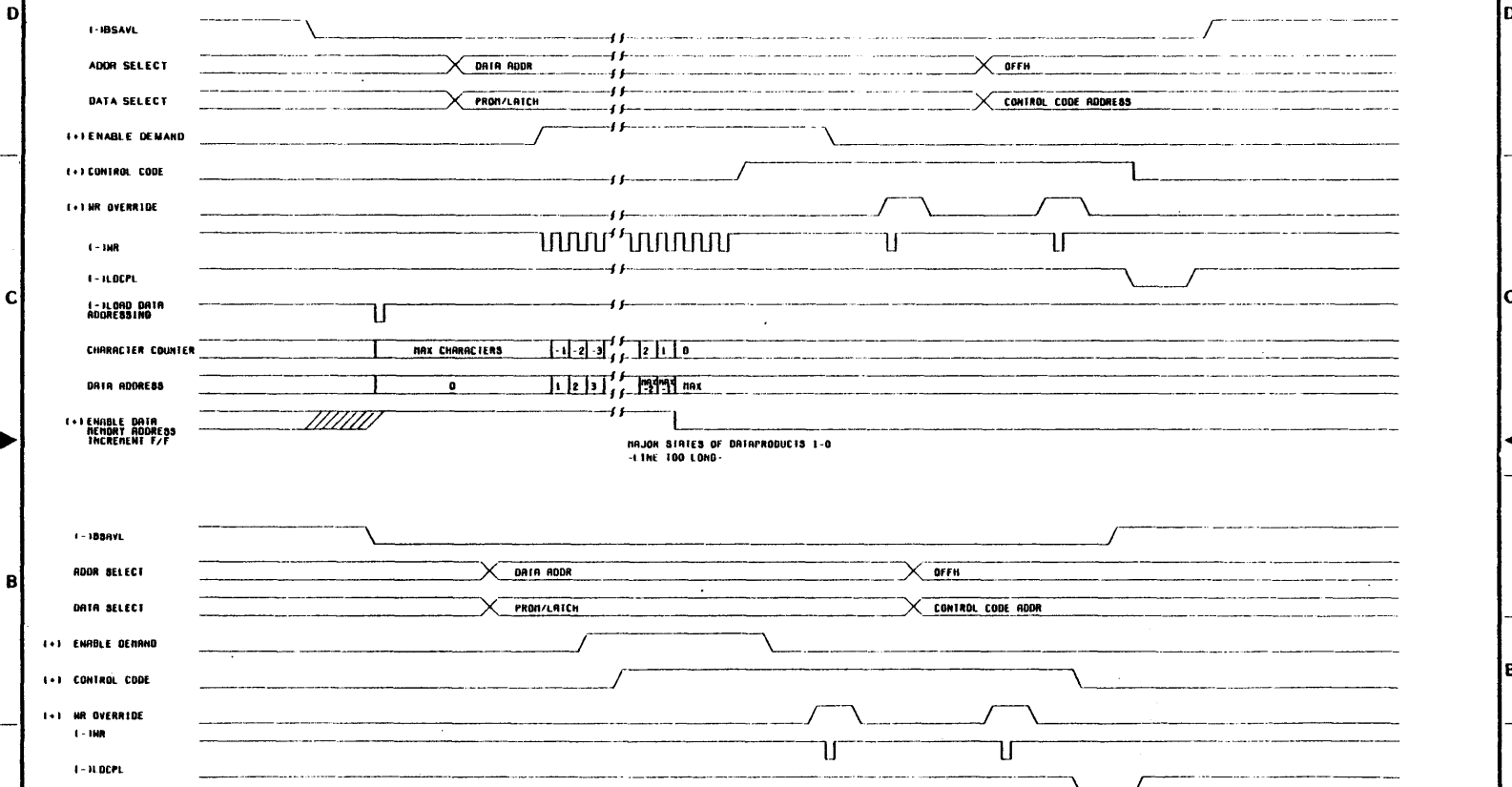
3

2

1

FORM 1004A USE 0-21 1962

4 3 2 1



MAJOR STATES OF DATA PRODUCTS 1-0
-LINE TOO LONG-

MAJOR STATES OF DATA PRODUCTS 1-0
-RECEIVED CONTROL CODE ONLY-

13-7

44682854

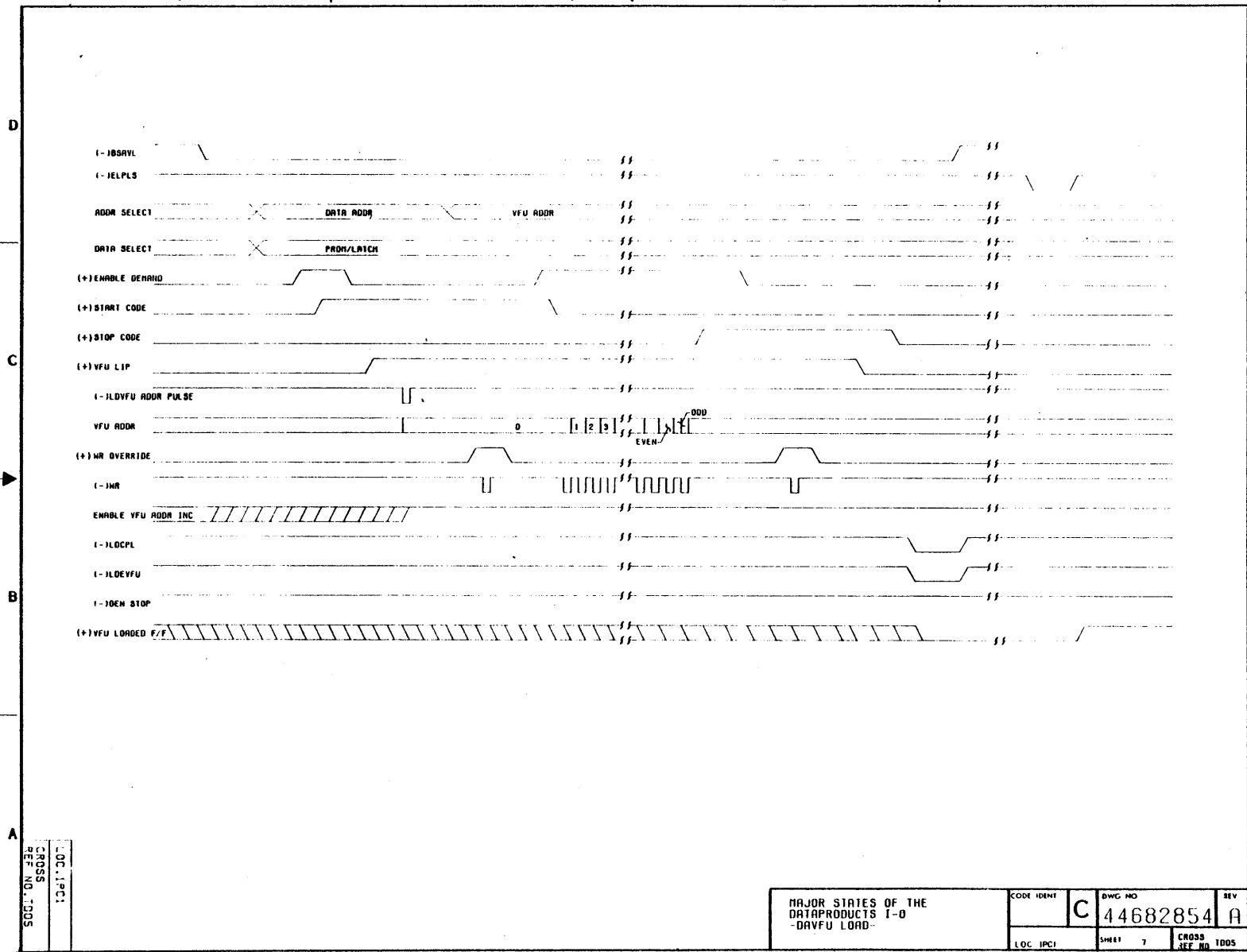
LOC IPC1
CROSS
REF NO. 1004

-LINE TO LONG-
AND
RECEIVED CONTROL CODE ONLY
TIMING DIAGRAMS

CODE IDENT	DWG NO	REV
	C 44682854	A
LOC IPC1	SHEET 8	CROSS REF NO 1004

4 3 2 1

4 | 3 | 2 | 1

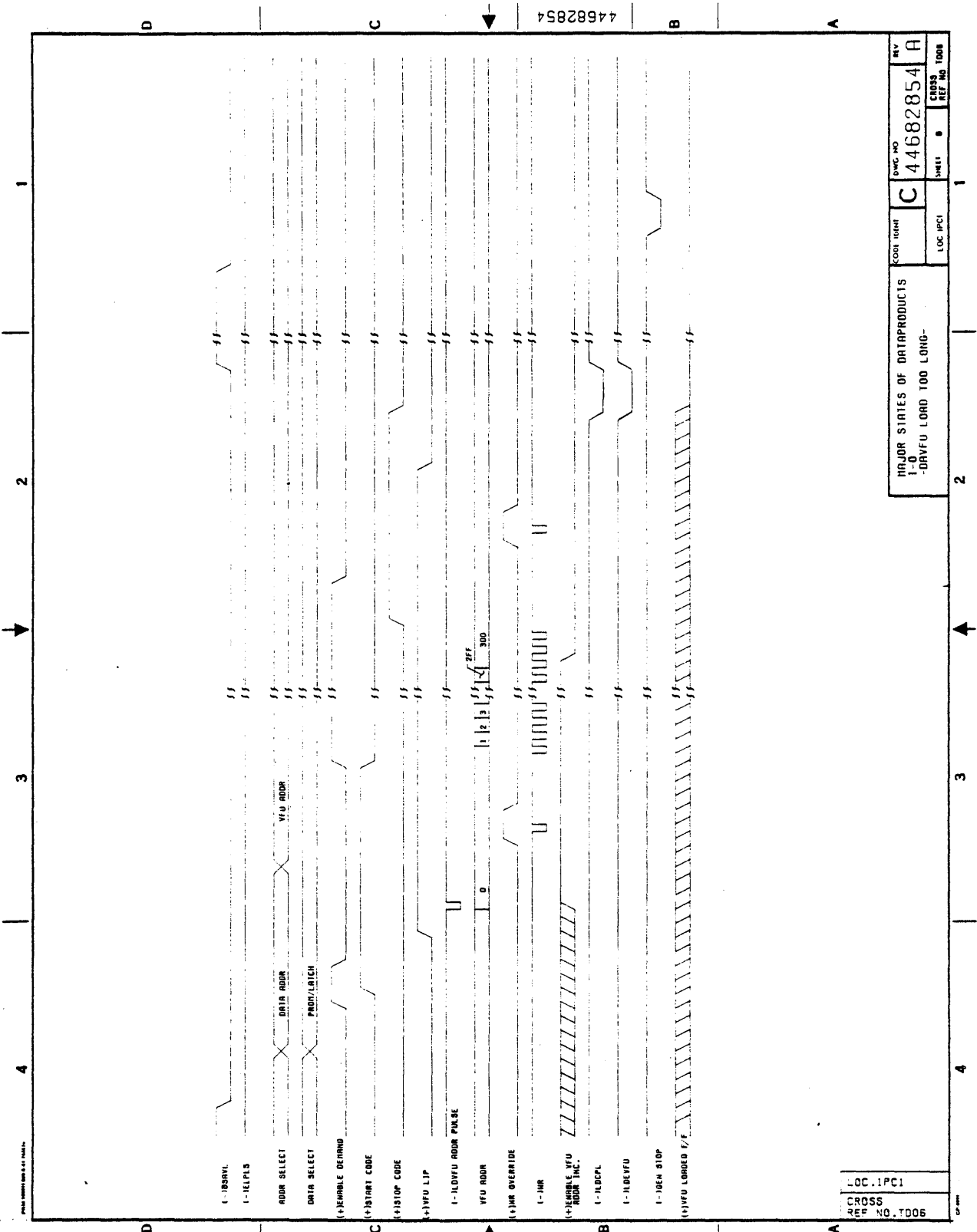


13-8

44682854

LOC IPCI
CROSS REF NO. 1005

4 | 3 | 2 | 1



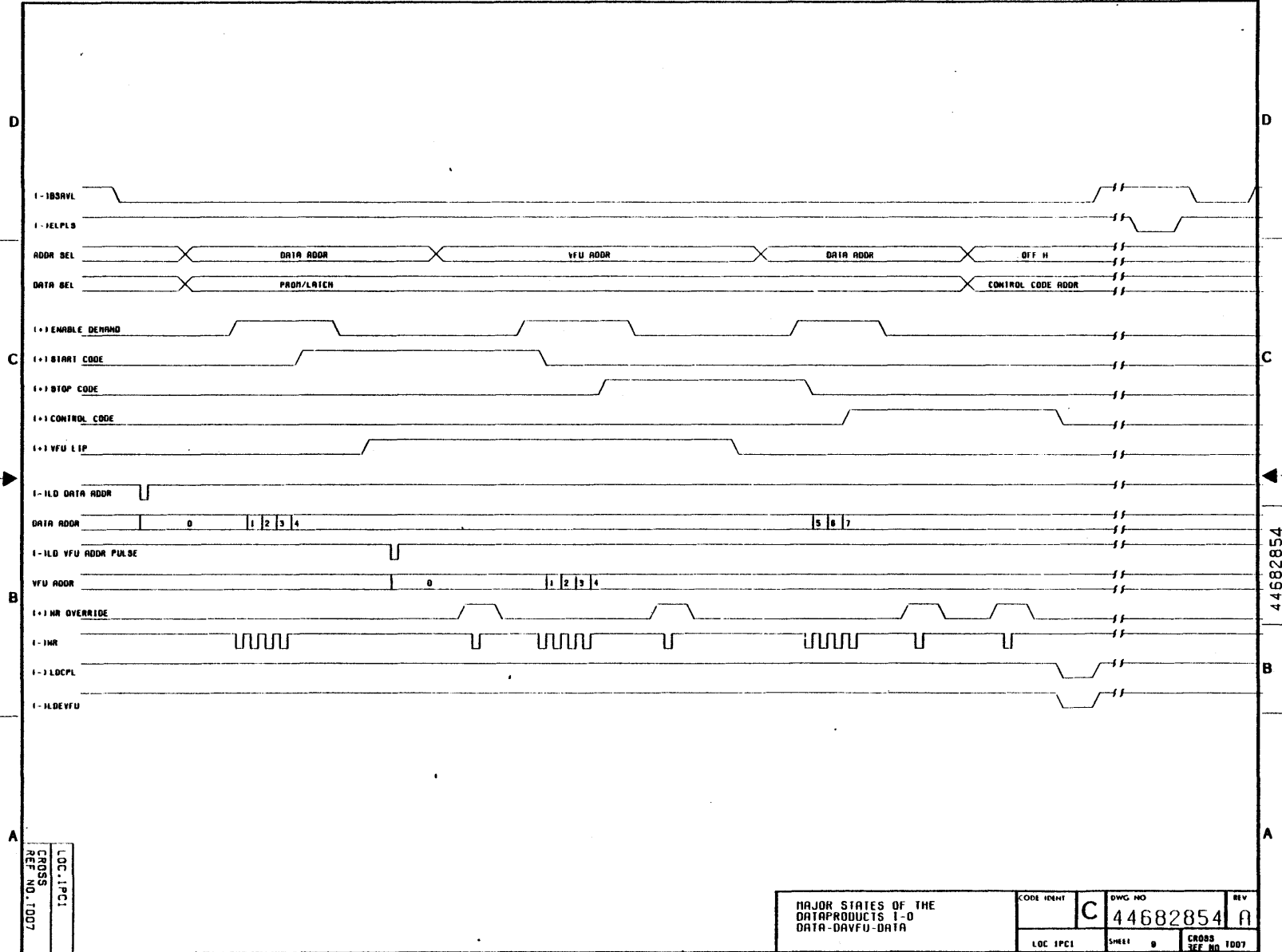
FORM 1000-108 0-01 70027

4

3

2

1



13-10

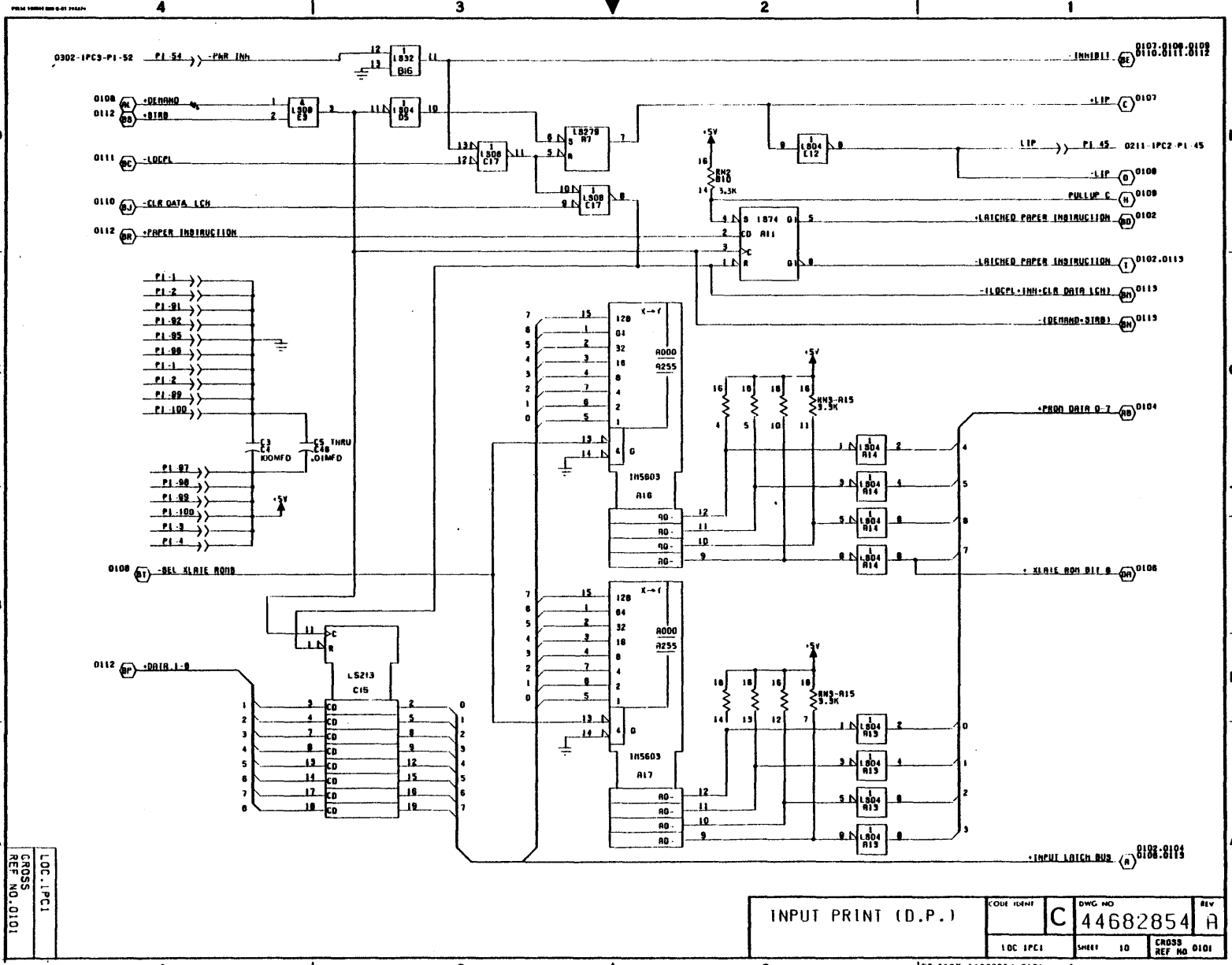
44682854

LOC IPC1
CROSS
REF NO. 1007

MAJOR STATES OF THE
DATAPRODUCTS I-O
DATA-DAVFU-DATA

CODE IDENT	C	DWG NO	44682854	REV	A
LOC IPC1		SHEET	9	CROSS REF NO	1007

EO. 360X. 44682854. 1007



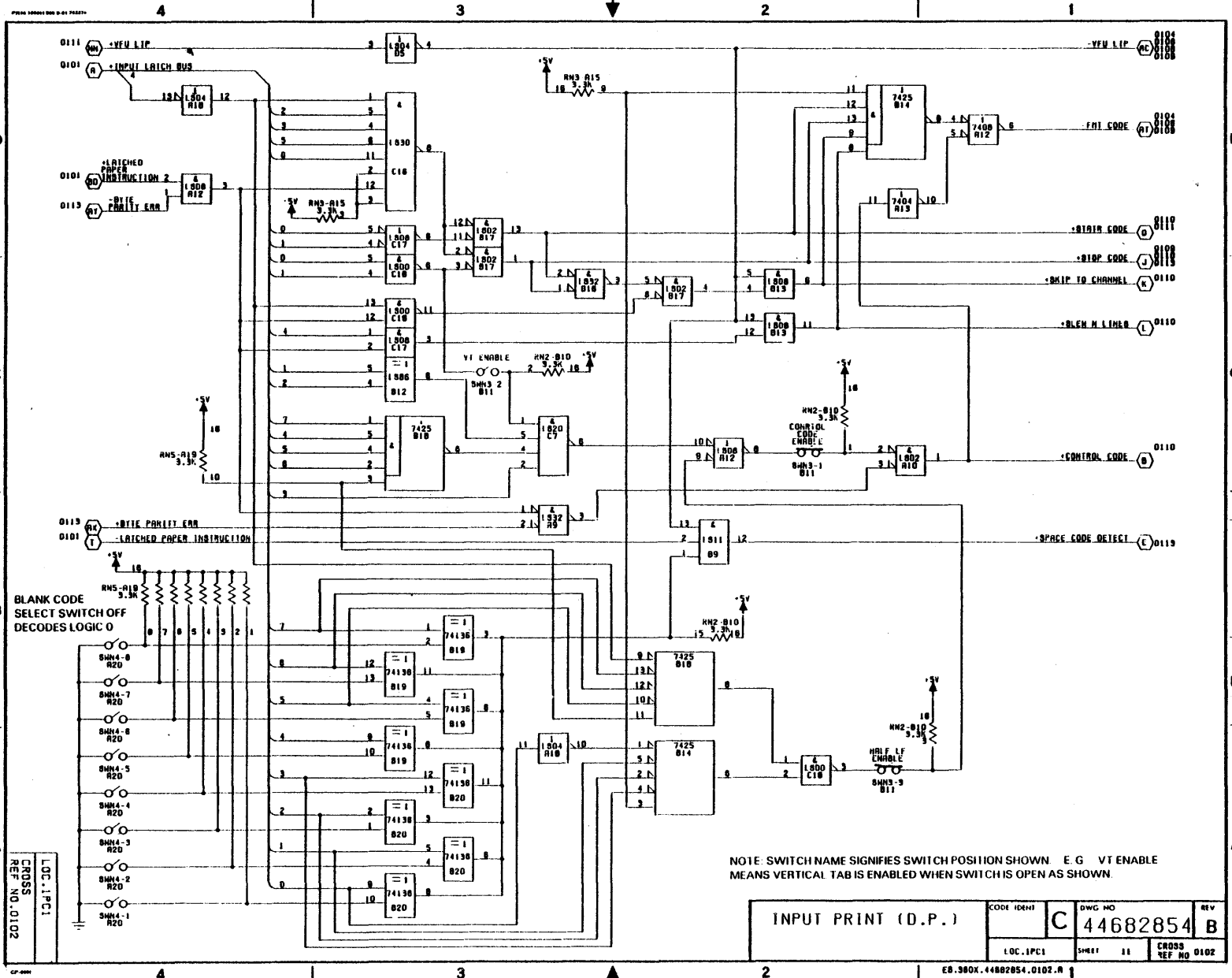
13-11

LOC. IPC1
CROSS
REF. NO. 0101

INPUT PRINT (D.P.)		CODE 14447	DWG. NO.	REV
		C	44682854	A
LOC. IPC1	SHEET 10	CROSS REF. NO. 0101		

ES.360X.44682854.0101

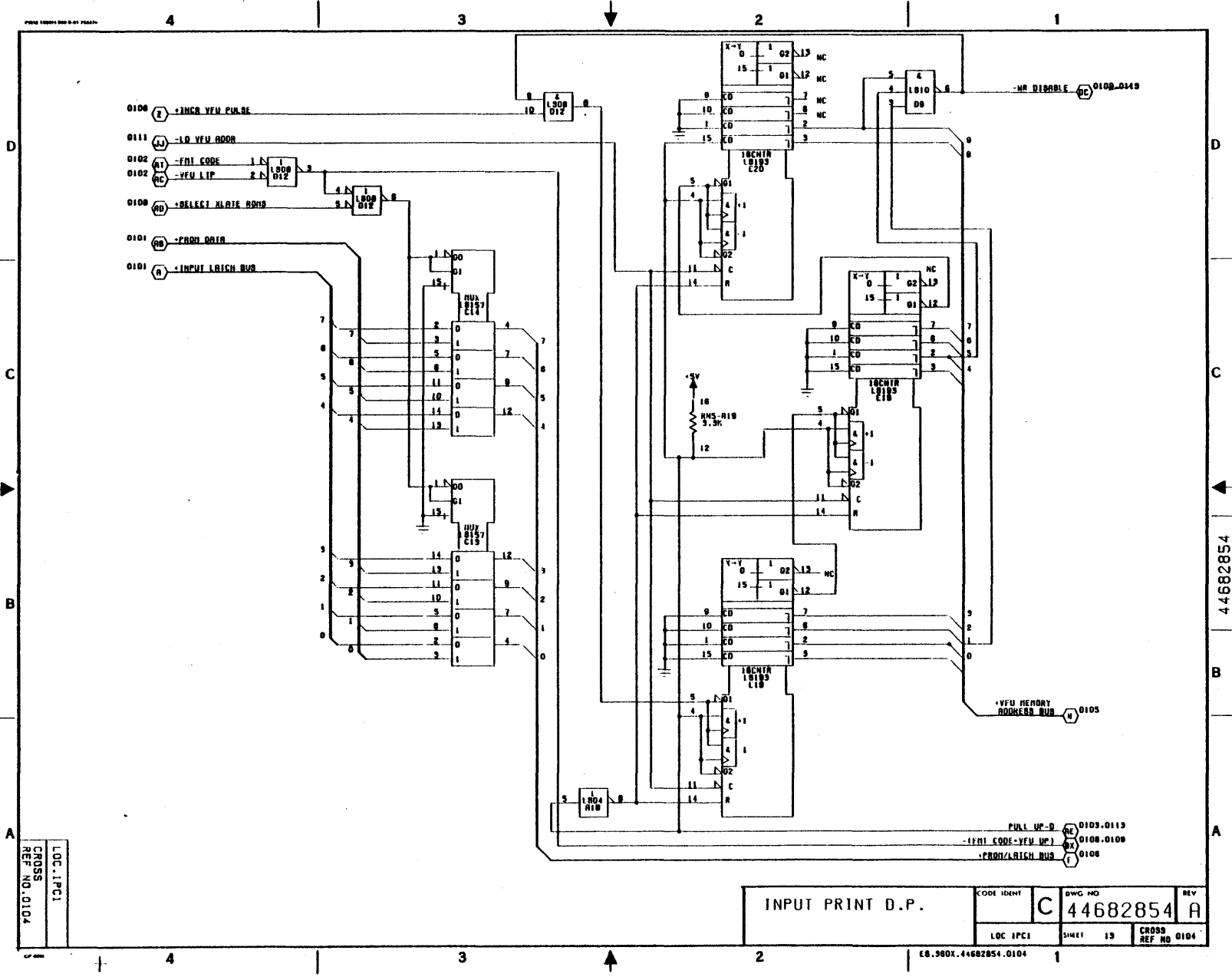
44682854



13-12

NOTE: SWITCH NAME SIGNIFIES SWITCH POSITION SHOWN. E.G. VT ENABLE MEANS VERTICAL TAB IS ENABLED WHEN SWITCH IS OPEN AS SHOWN.

INPUT PRINT (D.P.)		CODE IDENT	C	DWG NO	44682854	REV	B
LOC.1PC1	CROSS REF. NO. 0102	SHEET	11	CROSS REF. NO	0102		



13-14

LOC. IPC1
 CROSS
 REF. NO. 0104

INPUT PRINT D.P.

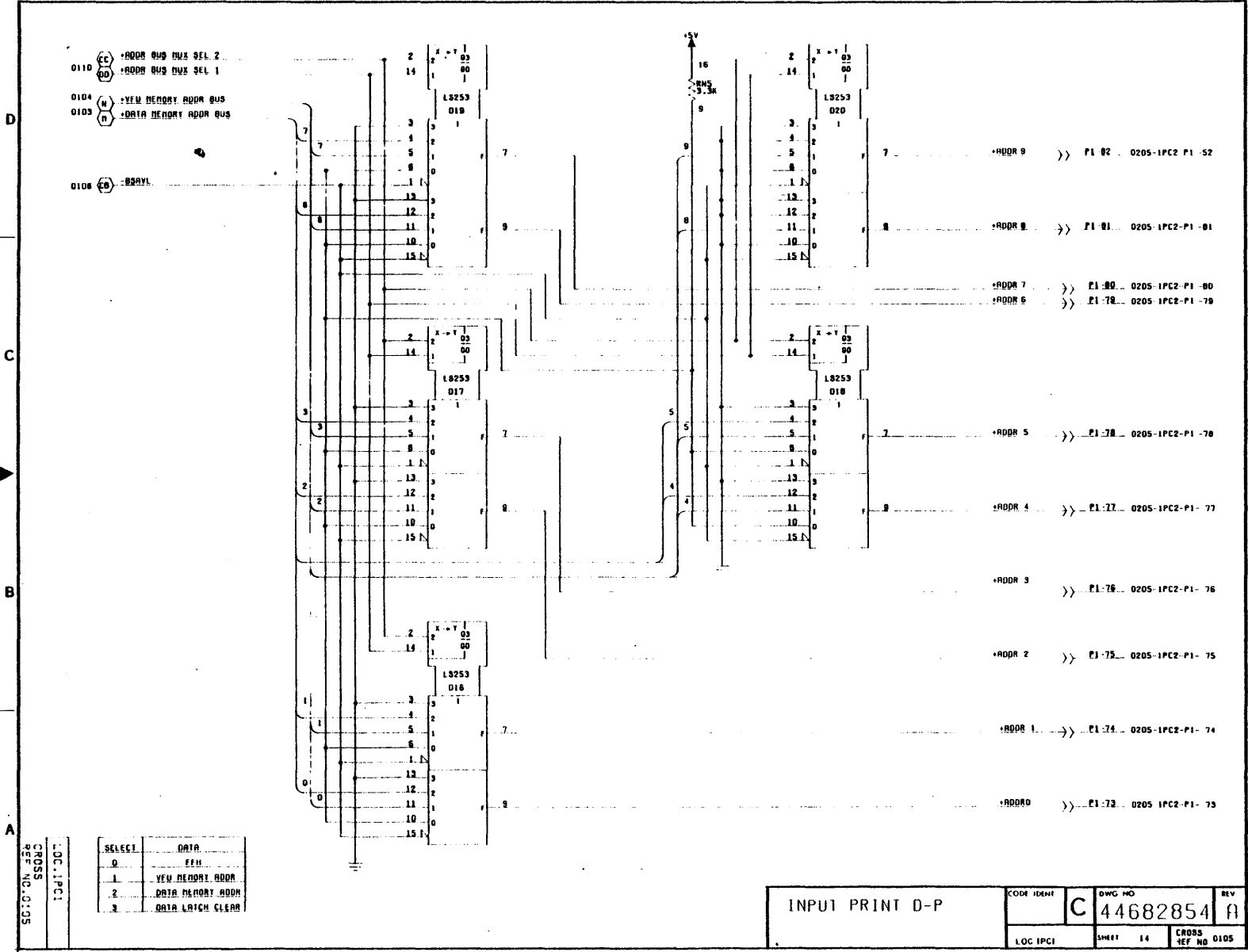
CODE IDENT	C	DWG NO	44682854	REV	A
LOC IPC1		SHEET	13	CROSS REF NO	0104

4

3

2

1



- 0110 (CC) +ADDR BUS MUX SEL 2
- 0110 (DD) +ADDR BUS MUX SEL 1
- 0104 (W) +VEU MEMORY ADDR BUS
- 0103 (H) +DATA MEMORY ADDR BUS
- 0106 (CB) +BAY1

SELECT	DATA
0	FFH
1	VEU MEMORY ADDR
2	DATA MEMORY ADDR
3	DATA LATCH CLEAR

LOC IPC1
CROSS
REF NO. 0105

INPUT PRINT D-P		CODE IDENT	C	DWG NO	44682854	REV	A
LOC IPC1	SHEET	14	CROSS REF NO	0105			

13-15

D

C

B

A

D

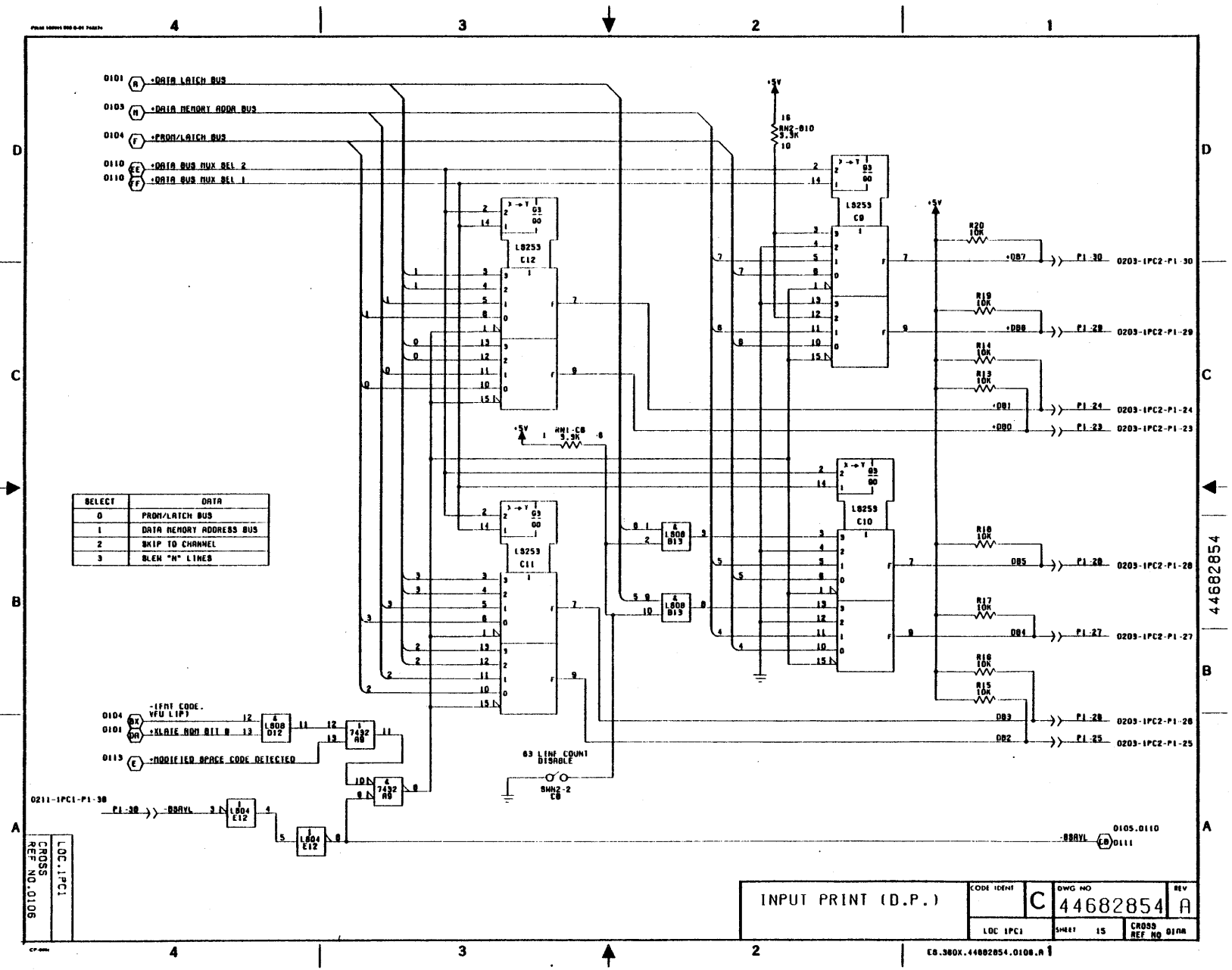
C

B

A

44682854

13-16



SELECT	DATA
0	PROM/LATCH BUS
1	DATA MEMORY ADDRESS BUS
2	SKIP TO CHANNEL
3	BLEW "N" LINES

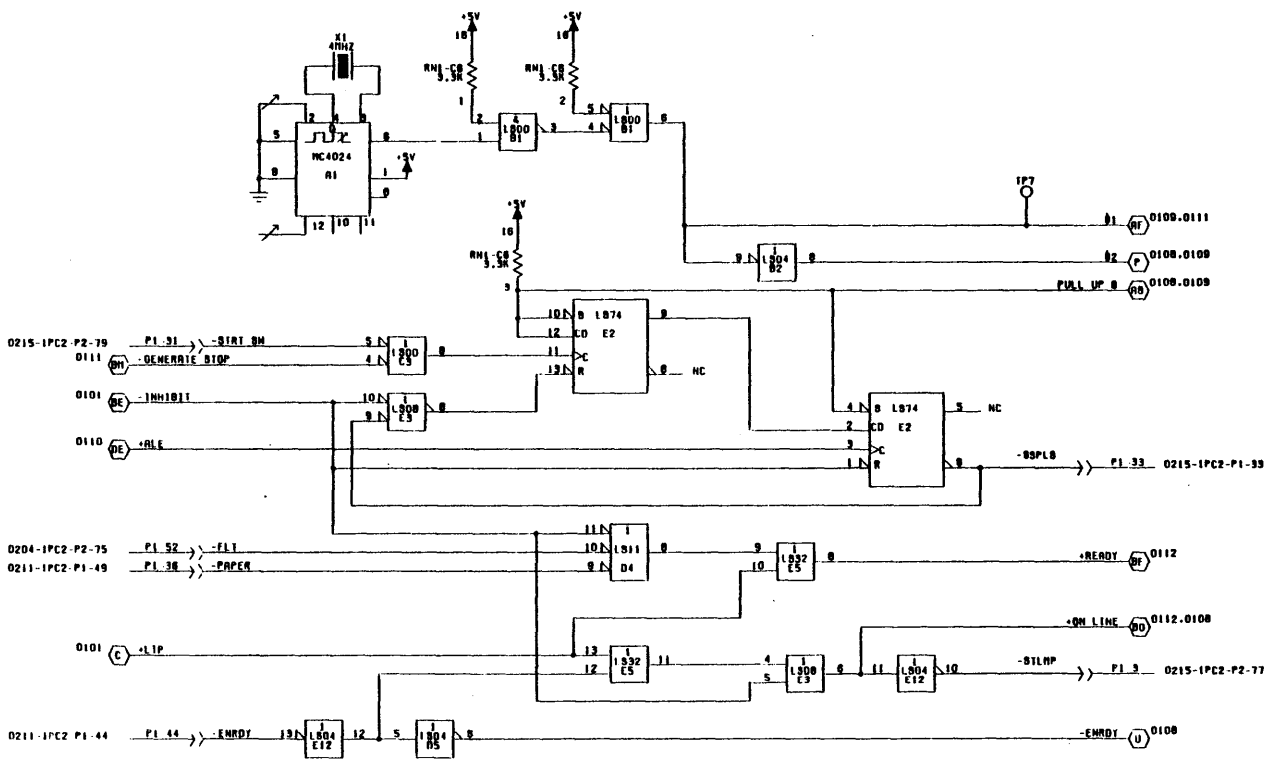
CROSS REF. NO. 0108
LOC. IPC1

INPUT PRINT (D.P.)		CODE IDENT	C	DWG NO	44682854	REV	A
LOC IPC1	SHEET	15	CROSS REF. NO.	0108			

4 3 2 1

D
C
B
A

D
C
B
A

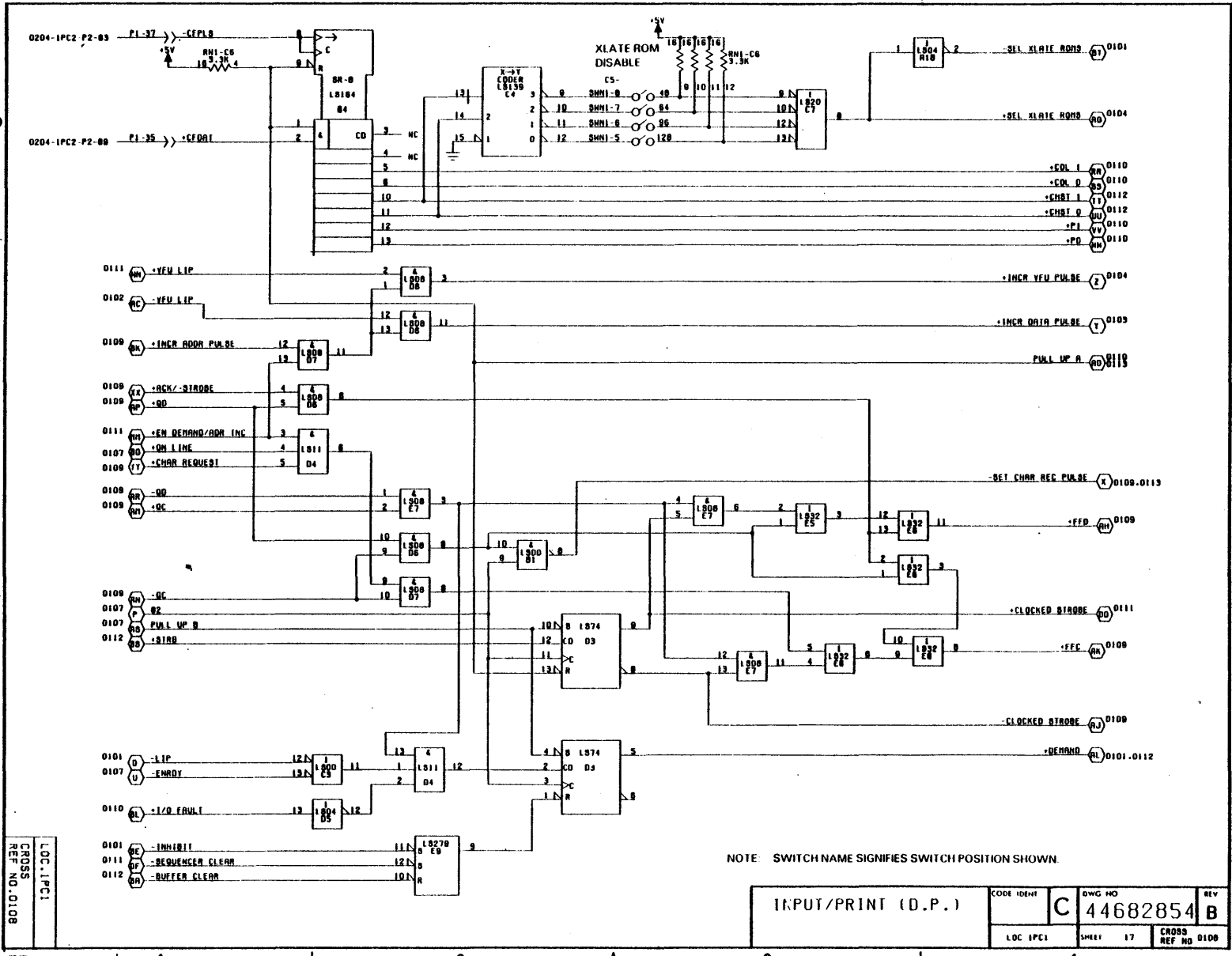


13-17

44682854

CROSS
REF NO: 0107

INPUT PRINT (D.P.)		CODE IDENT	DWG NO	REV
		C	44682854	A
LOC IPC1	SHEET	18	CROSS REF NO	0107



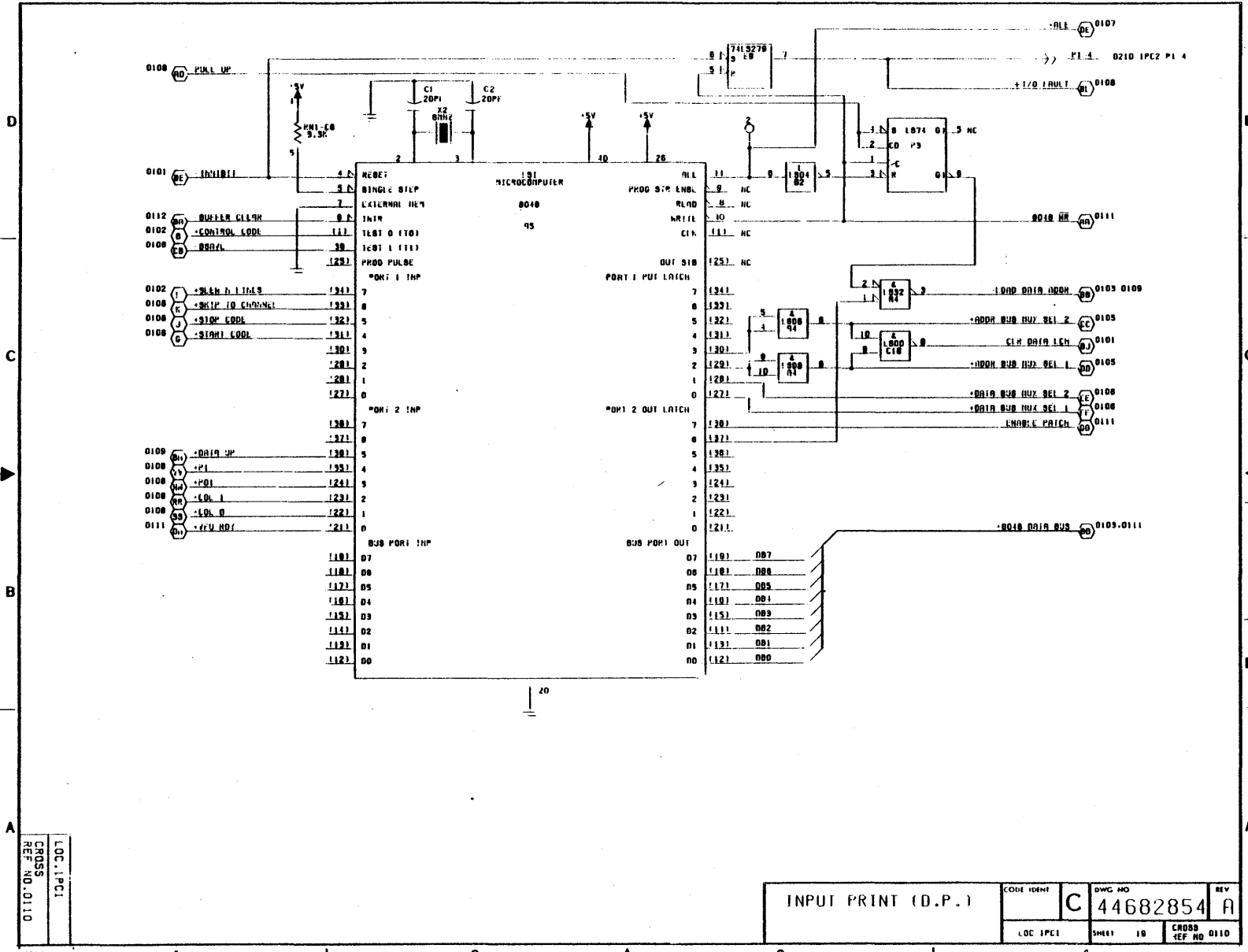
13-18

44682854

LOC. IPC1
CROSS REF. NO. 0108

INPUT/PRINT (D.P.)		CODE IDENT	C	DWG NO	44682854	REV	B
LOC IPC1	SHEET	17	CROSS REF NO	0108			

4 | 3 | 2 | 1



13-20

44682854

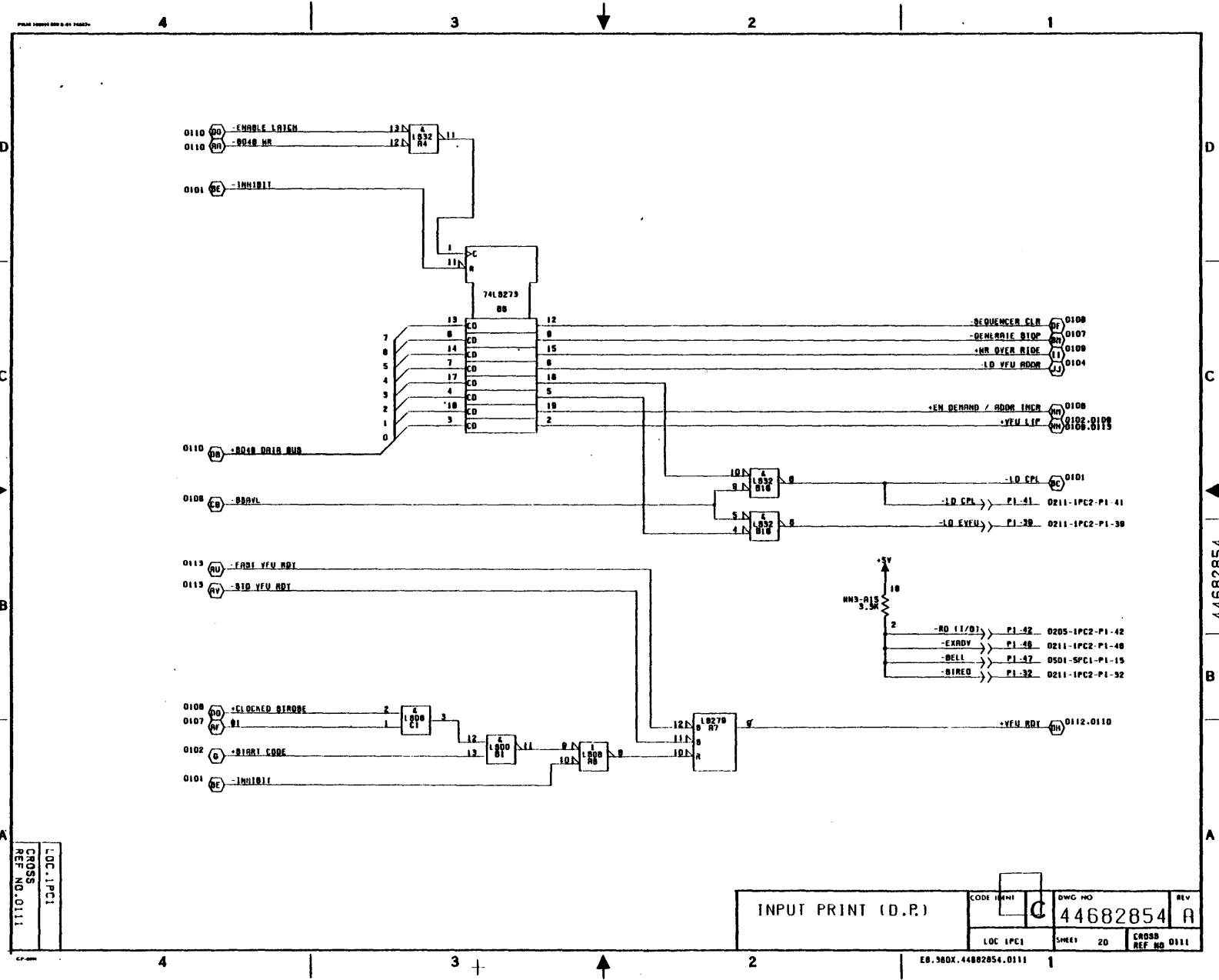
LOC. 1 PC1
CROSS
REF. NO. 0110

INPUT PRINT (D.P.)

CODE IDENT	C	DWG NO	44682854	REV	A
LOC 1 PC1		SHEET	18	CROSS	REF NO 0110

4 | 3 | 2 | 1

13-21

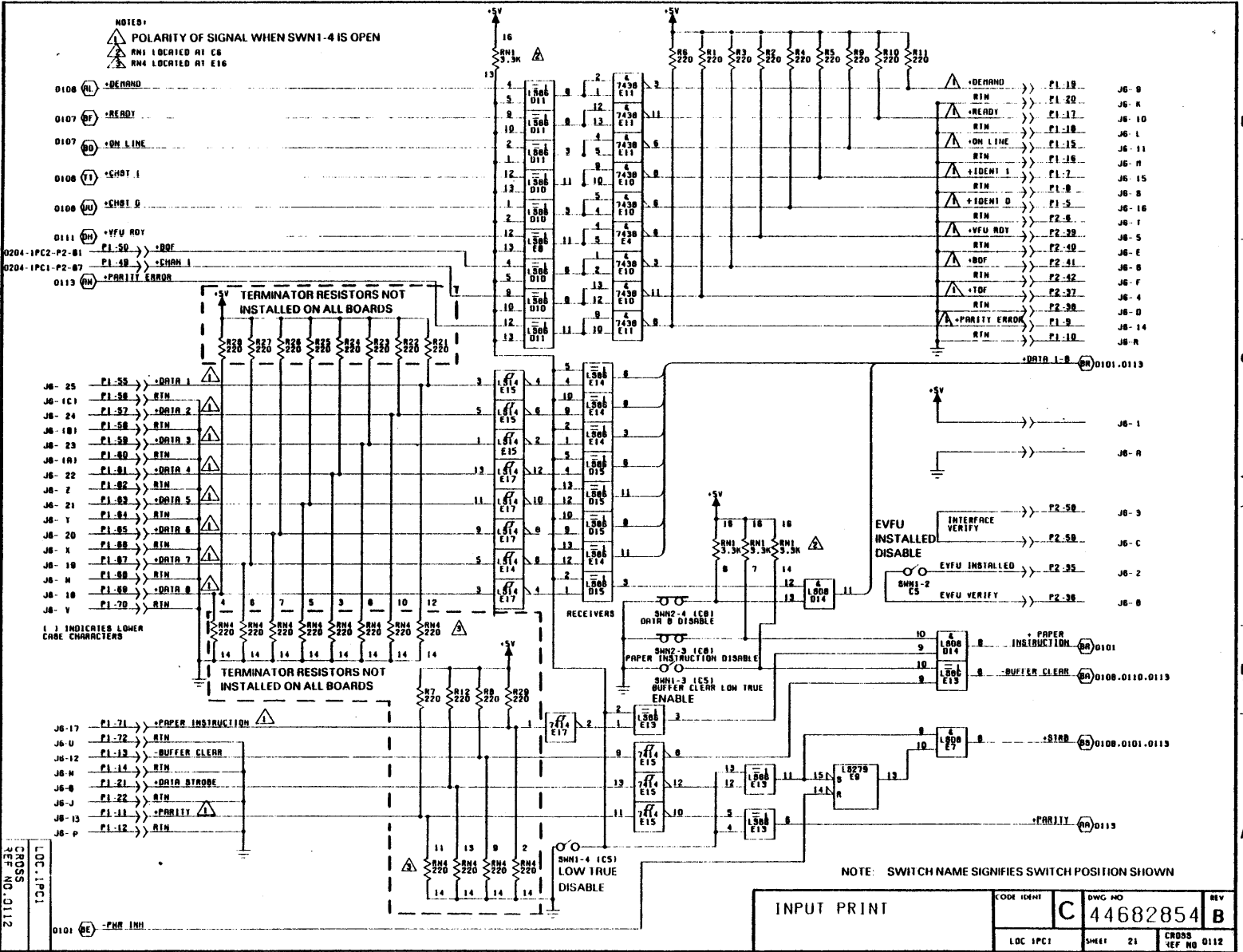


LOC 1PC1
CROSS
REF NO. 0111

INPUT PRINT (D.P.)		CODE	DWC NO	REV
		1	44682854	A
LOC 1PC1	SHEET 20	CROSS REF NO 0111		

EO. 380X. 44682854. 0111

44682854

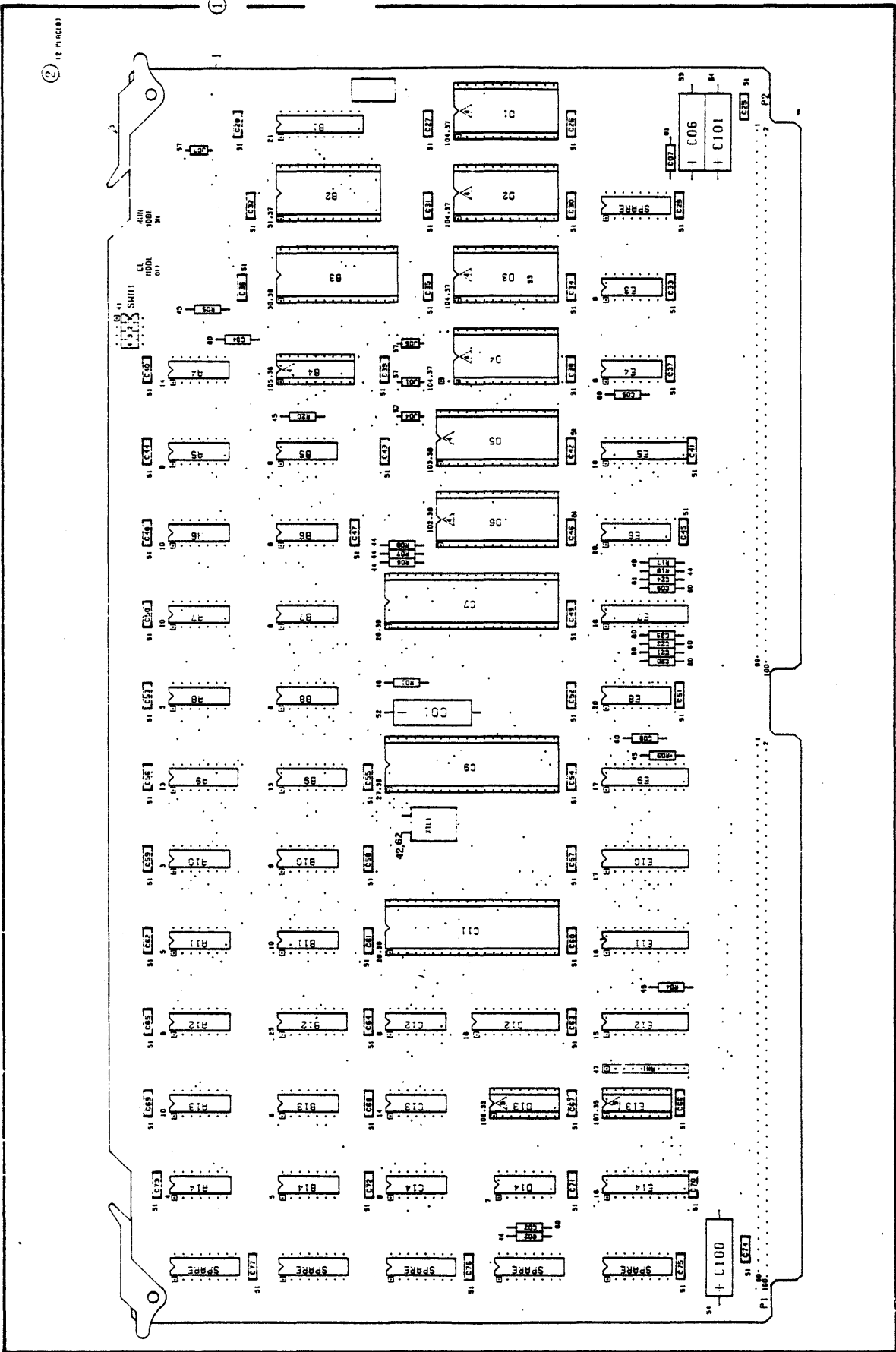


13-22

44682854

CROSS REF NO. 0112
LDC: IPC1

INPUT PRINT	CODE IDENT	C	DWG NO	44682854	REV	B
	LDC IPC1		SHEET	21	CROSS REF NO	0112



RS-232/SERIES 1 SERIAL INTERFACE PERSONALITY MODULE

CROSS REF NO.: 0800
 MODULE LOC: 1PC1
 SCHEMATIC NO: 44690816

PART NO: 44690817
 REV: 02
 SHT: 02

MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
0104/5PC1	10MS0 (-)	0808/P2-92
0104/5PC1	10MS1 (-)	0808/P2-88
0104/5PC1	10MS2 (-)	0808/P2-84
0104/5PC1	10RST (-)	0808/P2-86
0102/1PC1	12 (+)	0808/P1-69
0102/1PC6	5V (+)	0806/P1-97
0102/1PC6	5V (+)	0806/P1-98
0102/1PC6	5V (+)	0806/P1-99
0102/1PC6	5V (+)	0806/P1-100
0103/1PC6	5V (+)	0806/P2-3
0103/1PC6	5V (+)	0806/P2-4
0101/1PC2	B0F (+)	0808/P1-50
0103/1PC2	BSAVL (-)	0811/P2-38
0102/5PC1	BUF CLR (-)	0808/P1-78
0101/1PC2	CFDAT (+)	0810/P1-35
0101/1PC2	CFPLS (-)	0810/P1-37
0101/1PC2	CH1 (+)	0808/P1-49
0101/1PC2	CLK (2MHZ) (-)	0805/P1-48
0101/6PC1	CTS (CB/CS) (-)	0803/P1-15
0101/6PC1	DSR (CC/DM) (-)	0803/P1-19
0101/1PC2	ELPLS (-)	0807/P1-43
0101/1PC2	ENRDY (-)	0801/P1-44
0102/1PC2	FLT (-)	0808/P1-52
0101/1PC6	GND	0806/P1-1
0101/1PC6	GND	0806/P1-2
0102/1PC6	GND	0806/P1-91
0102/1PC6	GND	0806/P1-92
0102/1PC6	GND	0806/P1-95
0102/1PC6	GND	0806/P1-96
0103/1PC6	GND	0806/P2-1
0103/1PC6	GND	0806/P2-2
0103/1PC6	GND	0806/P2-19
0103/1PC6	GND	0806/P2-20
0103/1PC6	GND	0806/P2-49
0103/1PC6	GND	0806/P2-50
0104/1PC6	GND	0806/P2-69
0104/1PC6	GND	0806/P2-70
0104/1PC6	GND	0806/P2-99
0104/1PC6	GND	0806/P2-100
0101/1PC6	GND	0807/P1-6
0101/1PC6	GND	0807/P1-8

CROSS REF NO.: 0800
 MODULE LOC: 1PC1
 SCHEMATIC NO: 44690816

PART NO: 44690817
 REV: 02
 SHT: 03

MODULE INPUTS
 (continued)

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
0101/1PC6	GND	0807/P1-10
0101/1PC6	GND	0807/P1-12
0101/1PC6	GND	0807/P1-14
0101/1PC6	GND	0807/P1-16
0101/1PC6	GND	0807/P1-18
0101/1PC6	GND	0807/P1-20
0101/1PC6	GND	0807/P1-22
0102/1PC6	GND	0807/P1-56
0102/1PC6	GND	0807/P1-58
0102/1PC6	GND	0807/P1-60
0102/1PC6	GND	0807/P1-62
0102/1PC6	GND	0807/P1-64
0102/1PC6	GND	0807/P1-66
0102/1PC6	GND	0807/P1-68
0102/1PC6	GND	0807/P1-70
0102/1PC6	GND	0807/P1-72
0104/1PC6	GND	0807/P2-88
0103/1PC6	GND	0807/P2-40
0103/1PC6	GND	0807/P2-42
0103/1PC6	GND	0807/P2-44
0101/6PC1	INDATA (+)	0803/P1-5
0102/1PC3	INH (-)	0805/P1-54
0104/5PC1	OPTSEL (-)	0808/P2-90
0101/1PC2	PAPER ERR	0808/P1-36
0102/1PC2	PMIDX (-)	0801/P1-51
0101/6PC1	RDX (RD/BB) (-)	0803/P1-21
0101/6PC1	RING (-)	0803/P1-11
0101/6PC1	RLS (CF/RR) (-)	0803/P1-17
0103/6PC1	RSETIN (DD/RT) (-)	0810/P2-39
0101/6PC1	SP6 (+)	0803/P1-9
0101/6PC1	SP7 (+)	0803/P1-7
0101/1PC2	START SW (-)	0808/P1-31
0104/5PC1	STPOPT (-)	0808/P2-82
0103/6PC1	T SET IN (DB/ST) (-)	0810/P2-41
0101/6PC1	TEST (-)	0803/P1-13
0103/1PC6	VPWR (+)	0806/P2-7
0103/1PC6	VPWR (+)	0806/P2-8
0103/1PC6	VPWR RET	0806/P2-9
0103/1PC6	VPWR RET	0806/P2-10

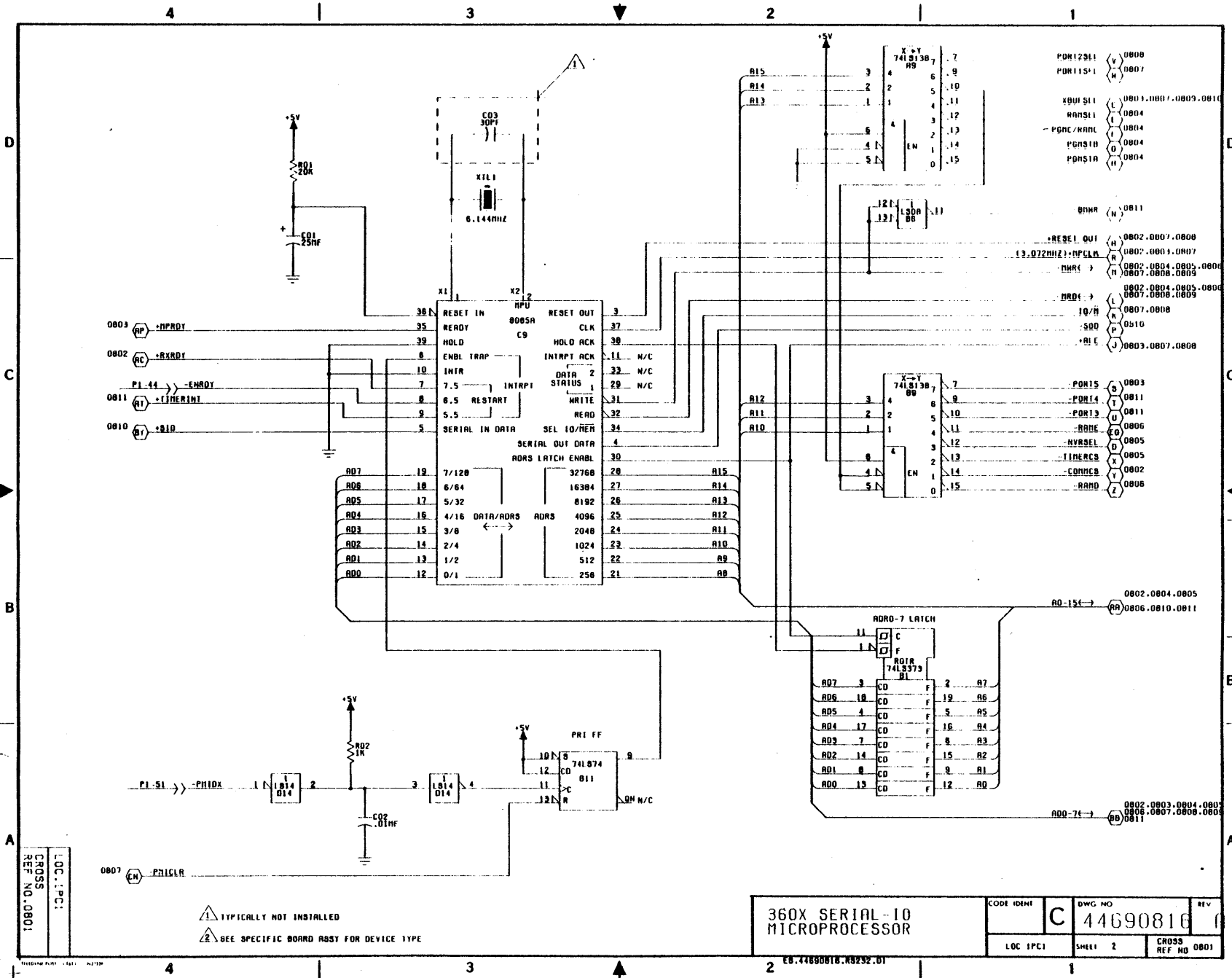
CROSS REF NO.: 0800
 MODULE LOC: 1PC1
 SCHEMATIC NO: 44690816

PART NO: 44690817
 REV: 02
 SHT: 04

MODULE OUTPUTS

<u>MODULE CROSS REF NO.</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
0811/P2-96	IO FLT LED (-)	0104/5PC1
0811/P2-76	IO SET LED (-)	0104/5PC1
0811/P2-98	IO TEST LED (-)	0104/5PC1
0810/P1-73	ADR0	0102/1PC2
0810/P1-74	ADR1	0102/1PC2
0810/P1-75	ADR2	0102/1PC2
0810/P1-76	ADR3	0102/1PC2
0810/P1-77	ADR4	0102/1PC2
0810/P1-78	ADR5	0102/1PC2
0810/P1-79	ADR6	0102/1PC2
0810/P1-80	ADR7	0102/1PC2
0810/P1-81	ADR8	0102/1PC2
0810/P1-82	ADR9	0102/1PC2
0811/P1-47	BELL (-)	0101/5PC1
0811/P2-97	BUFFER CLEAR LED (-)	0104/5PC1
0809/P1-23	DB0	0101/1PC2
0809/P1-24	DB1	0101/1PC2
0809/P1-25	DB2	0101/1PC2
0809/P1-26	DB3	0101/1PC2
0809/P1-27	DB4	0101/1PC2
0809/P1-28	DB5	0101/1PC2
0809/P1-29	DB6	0101/1PC2
0809/P1-30	DB7	0101/1PC2
0802/P2-35	DTR (-)	0103/6PC1
0807/P1-46	EXADV (-)	0101/1PC2
0805/P1-81	INH (-)	0102/6PC1
0807/P1-4	IOFLT (+)	0101/1PC2
0805/P2-74	IOXFRLED (-)	0104/5PC1
0807/P1-41	LDCPL (-)	0101/1PC2
0807/P1-39	LDEVFU (-)	0101/1PC2
0807/P1-45	LIP (-)	0101/1PC2
0811/P1-65	LOCAL LBK (-)	0102/6PC1
0809/P1-42	RD (-)	0101/1PC2
0811/P1-57	REM LBK (-)	0102/6PC1
0811/P2-58	REV CHAN (-)	0104/6PC1
0802/P2-36	RTS (-)	0103/6PC1
0811/P2-43	SPARE 1	0103/6PC1
0811/P2-59	SPARE 2	0104/6PC1
0811/P2-94	SPARE LED 2 (-)	0104/5PC1
0807/P1-33	SSPLS (-)	0101/1PC2
0807/P1-3	STLMP (-)	0101/1PC2
0807/P1-32	STREQ (-)	0101/1PC2
0802/P2-37	TDATA (+)	0103/6PC1
0807/P1-63	TSETOUT (-)	0102/6PC1
0806/P1-67	VPWR (+)	0102/6PC1
0809/P1-40	WR (-)	0101/1PC2
0807/P1-34	XBUFSEL (-)	0101/1PC2

13-28



LOC.: P.C.
CROSS
REF NO. 0801

△ TYPICALLY NOT INSTALLED
△ SEE SPECIFIC BOARD ASSY FOR DEVICE TYPE

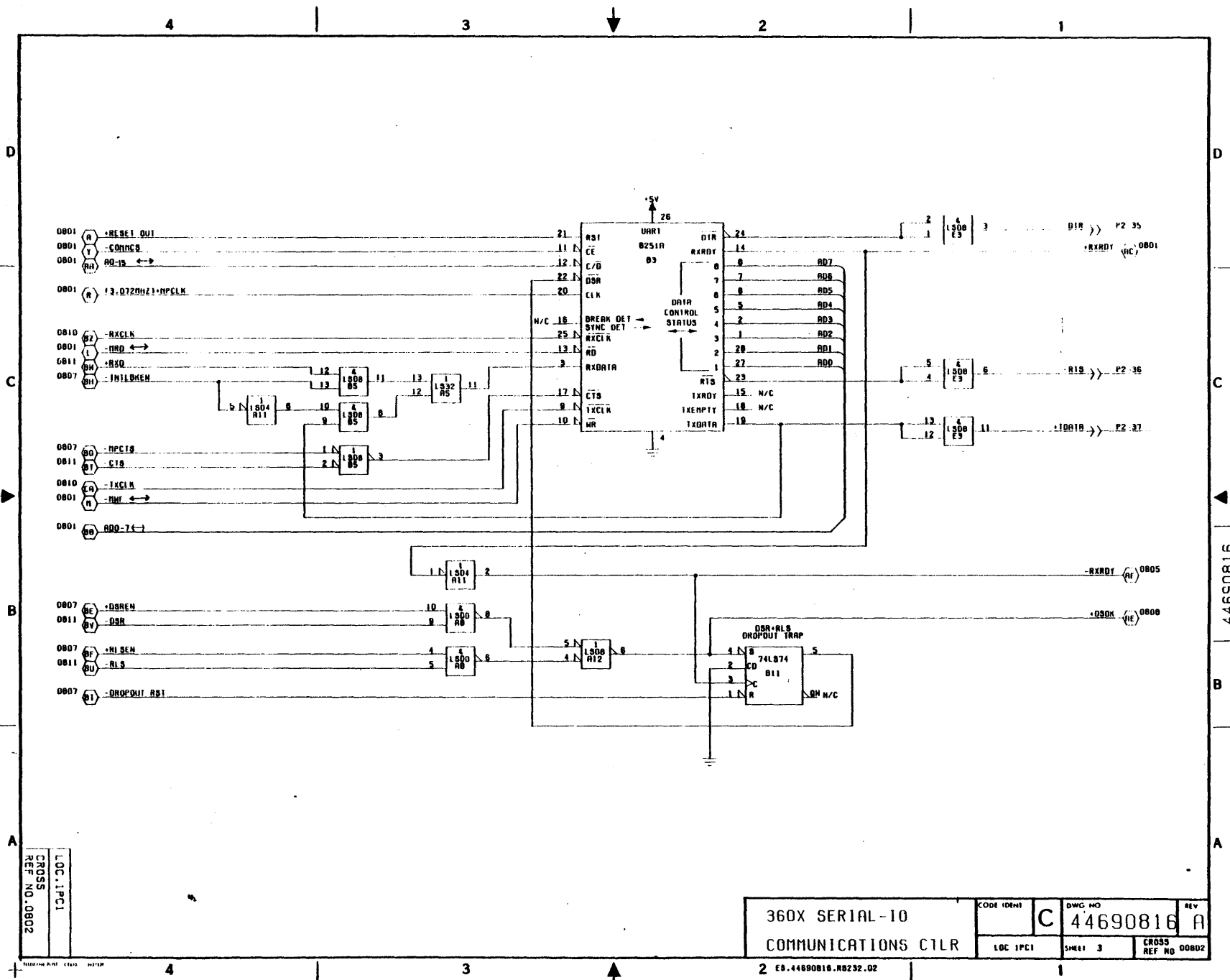
360X SERIAL-10
MICROPROCESSOR

CODE IDENT	C	DWG NO	44690816	REV	
LOC IPC1		SHEET	2	CROSS REF NO	0801

EB-44690816-AB232-01

44690816

13-29



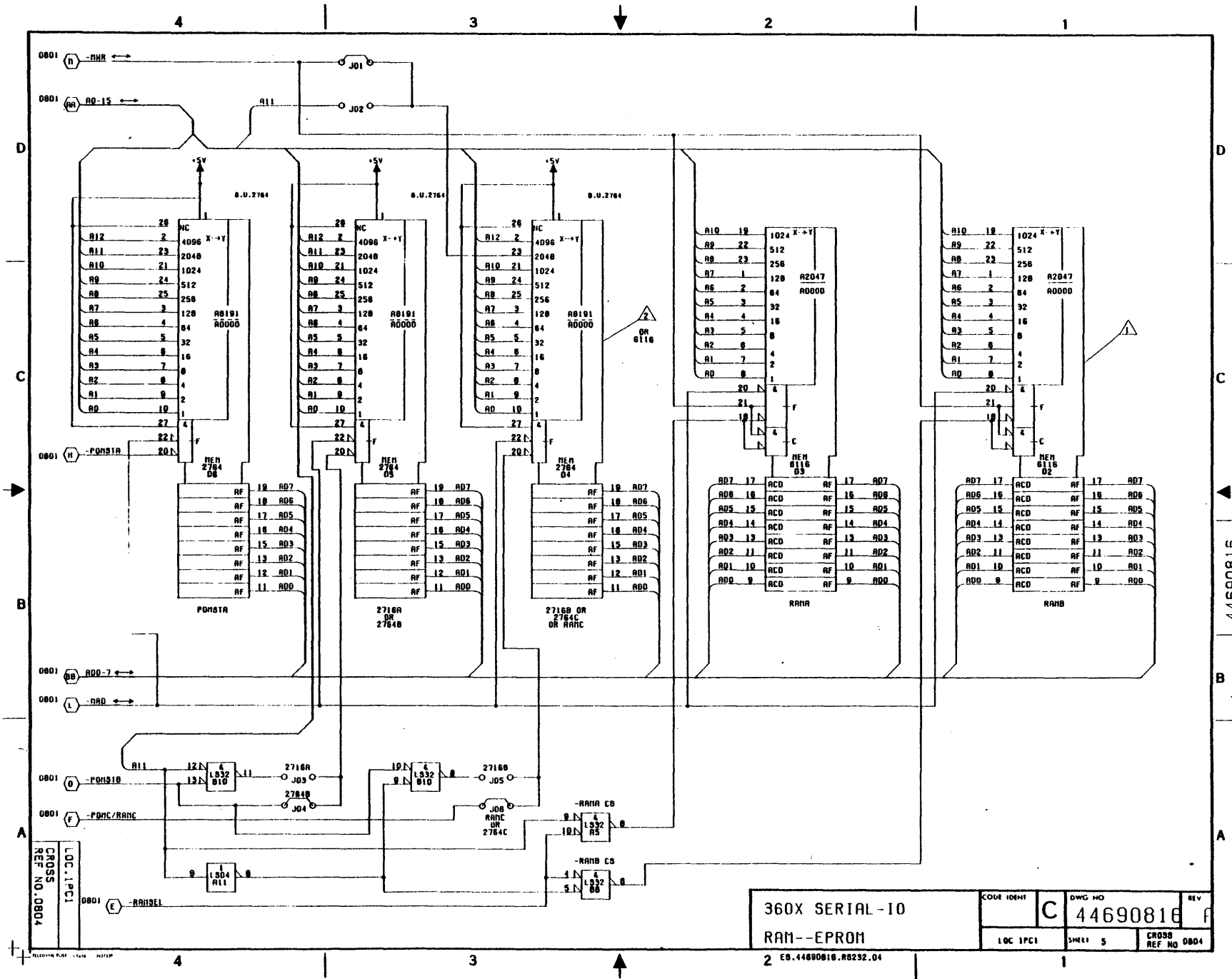
LOC: IPC1
 CROSS REF NO: 0802

360X SERIAL-10		CODE IDENT	DWG NO	REV
COMMUNICATIONS CTRLR		C	44690816	A
LOC IPC1	SHEET 3	CROSS REF NO 0802		

2 ES. 44690816.0232.02

44690816

13-31

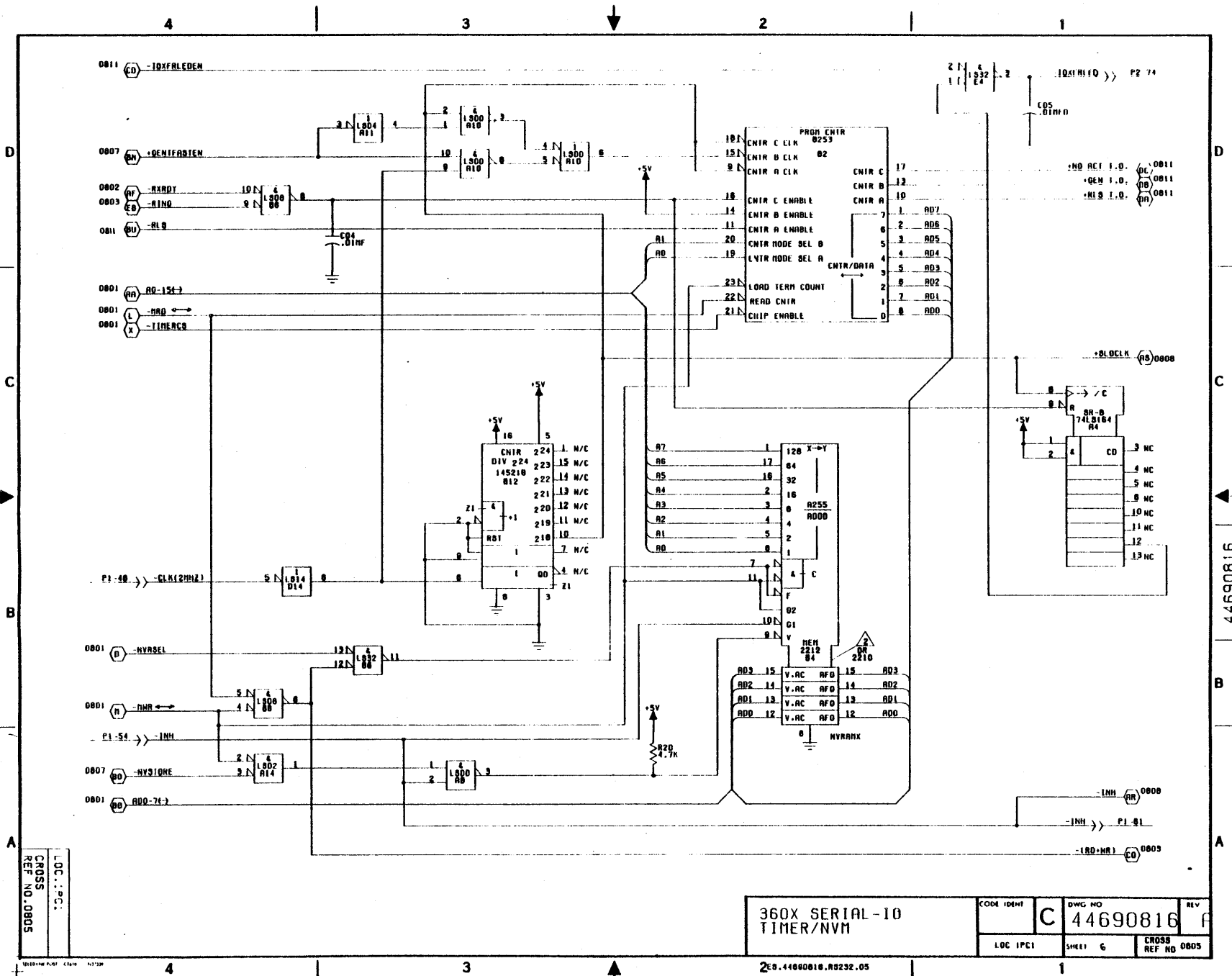


360X SERIAL-IO		CODE IDENT	DWG NO	REV
RAM--EPROM		C	44690816	F
LOC 1PC1	SHEET 5	CROSS REF NO 0804		

44690816

2 ES.44690816.R0232.04

13-32



CROSS
REF NO. 0805

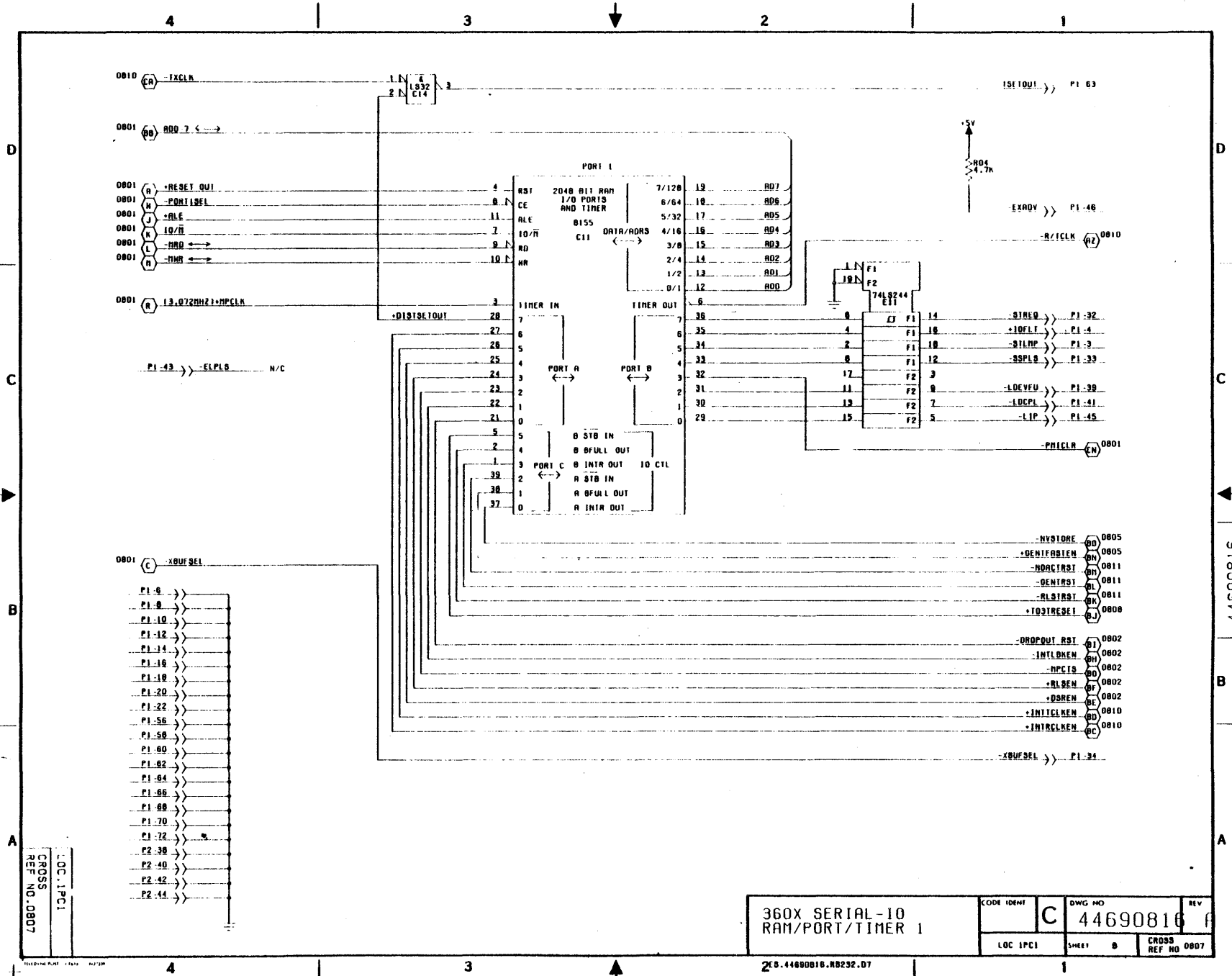
360X SERIAL-10
TIMER/NVM

CODE IDENT	C	DWG NO	44690816	REV	A
LOC IPC1		SHEET	6	CROSS REF NO	0805

2Ed. 44690816.08232.05

44690816

13-34



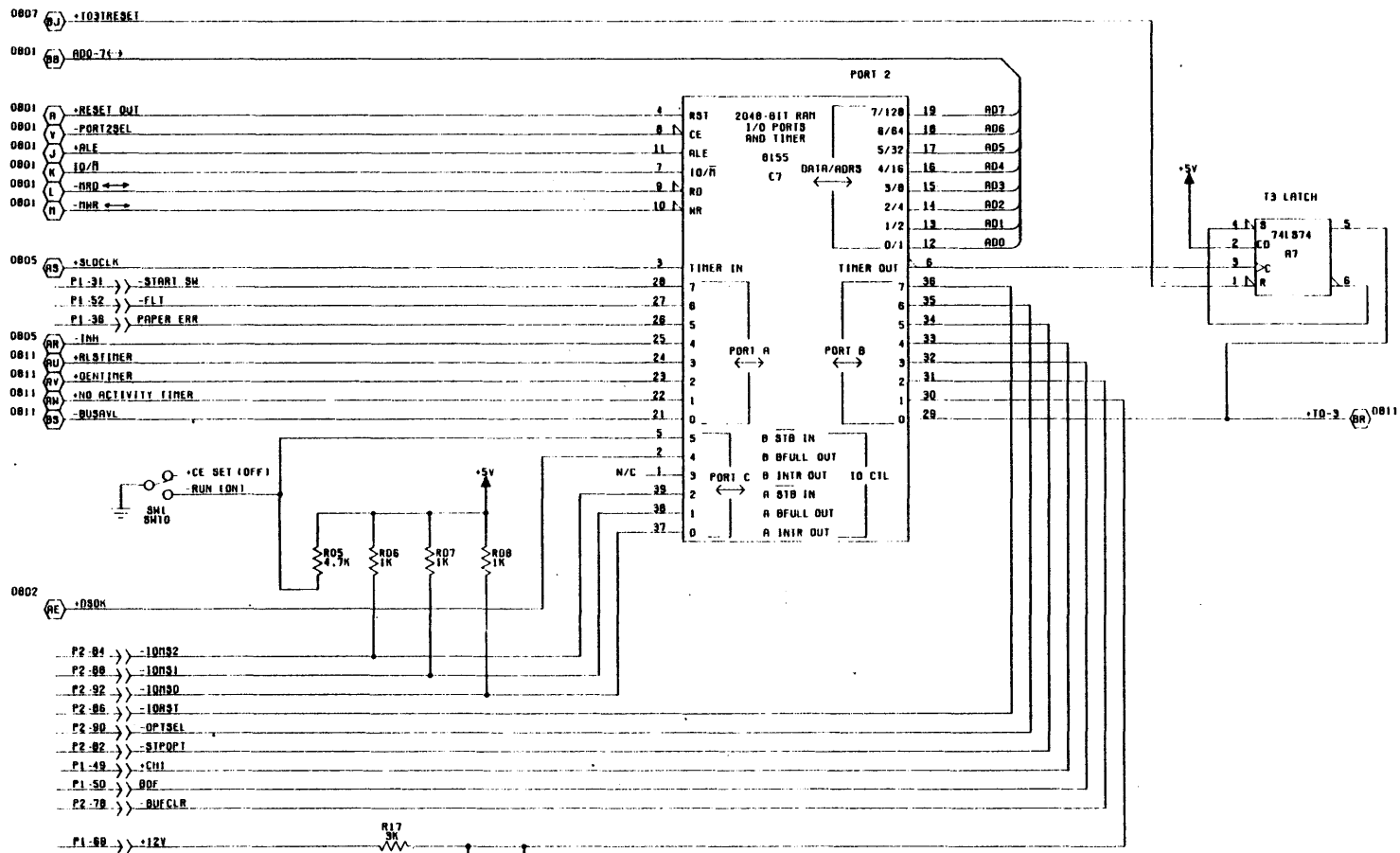
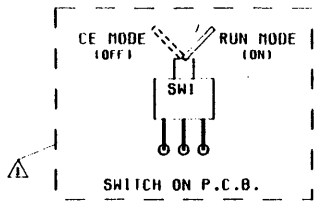
LOC. 1PC1
 CROSS REF. NO. 0807

360X SERIAL-10 RAM/PORT/TIMER 1		CODE IDENT C	DWG NO 44690816	REV A
LOC IPC1	SHEET 8	CROSS REF NO 0807		

20. 44690816. 08232.07

44690816

4 | 3 | 2 | 1



13-35

LOC 1PC1
CROSS
REF NO. 0808

360X SERIAL-10
RAM/PORT/TIMER 2

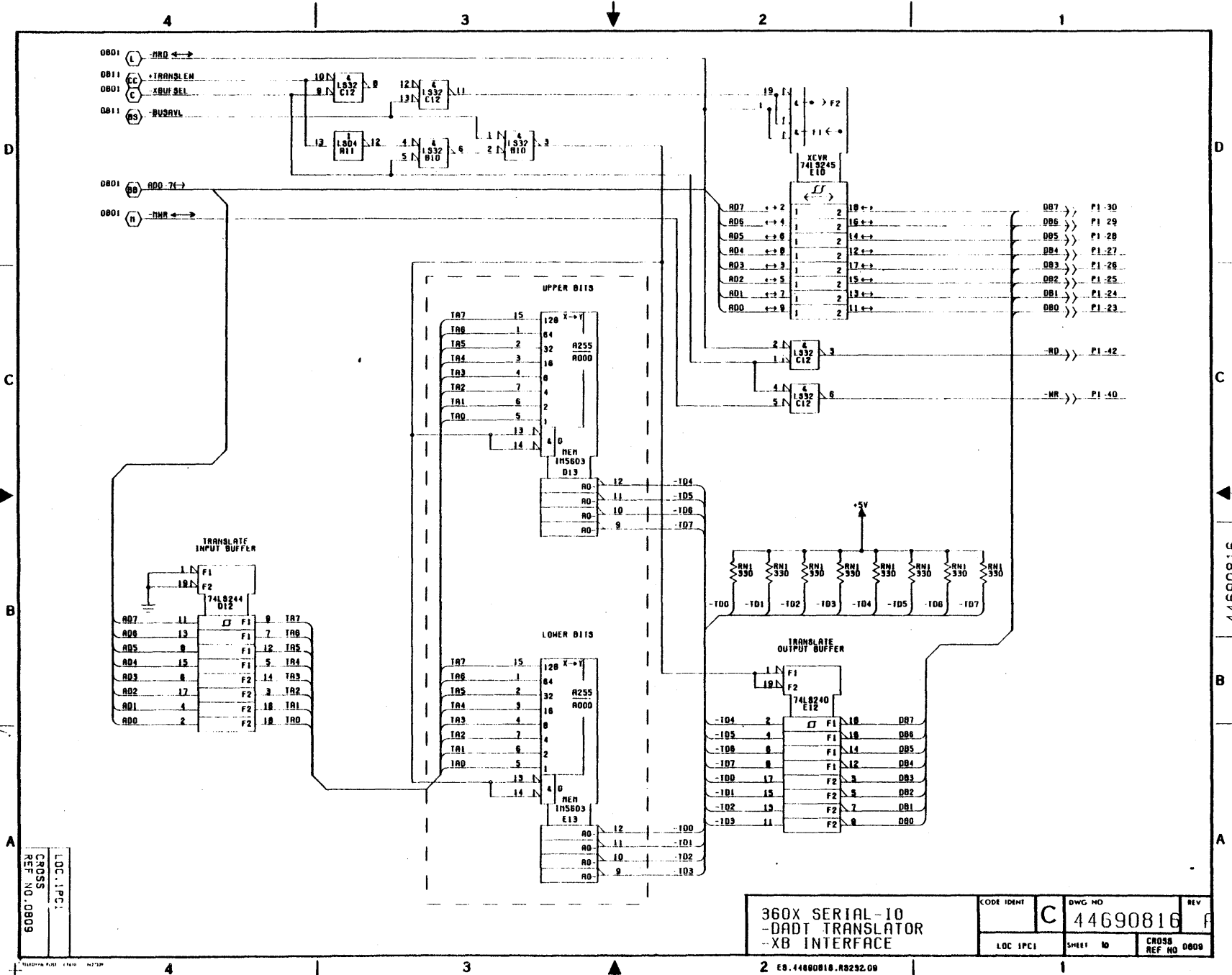
CODE IDENT	C	DWG NO	44690816	REV	A
LOC 1PC1	SHEET	9	CROSS REF NO	0808	

4 | 3 | 2 | 1

2 ES.44690816.RS232.08

44690816

13-36



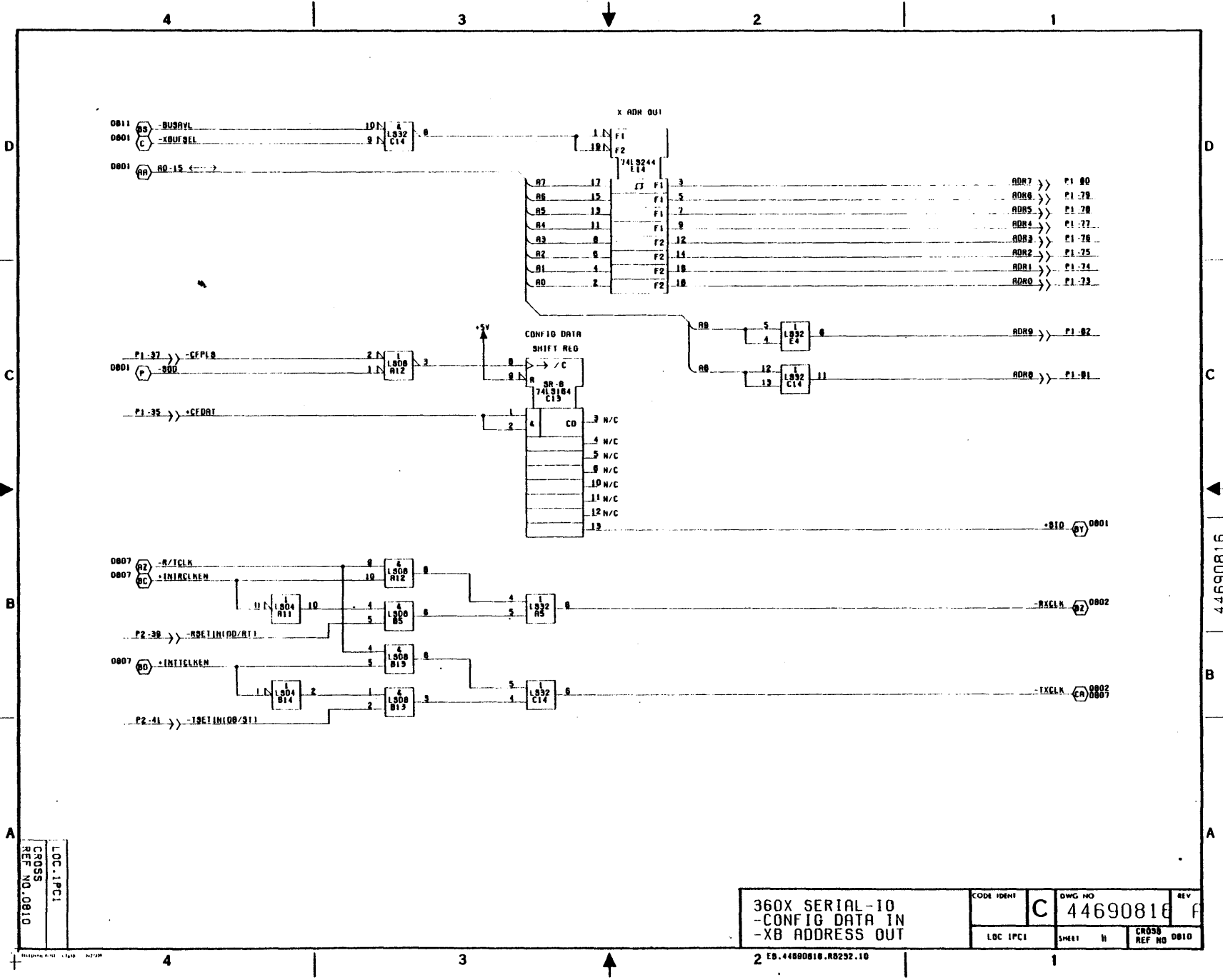
LOC. 1 PC
 CROSS
 REF. NO. 0809

360X SERIAL-10
 -DADI TRANSLATOR
 -XB INTERFACE

CODE IDENT	DWG NO	REV
	C 44690816	A
LOC IPC1	SHEET NO	CROSS REF NO 0809

44690816

13-37



LOC 1PC1
 CROSS
 REF NO. 0810

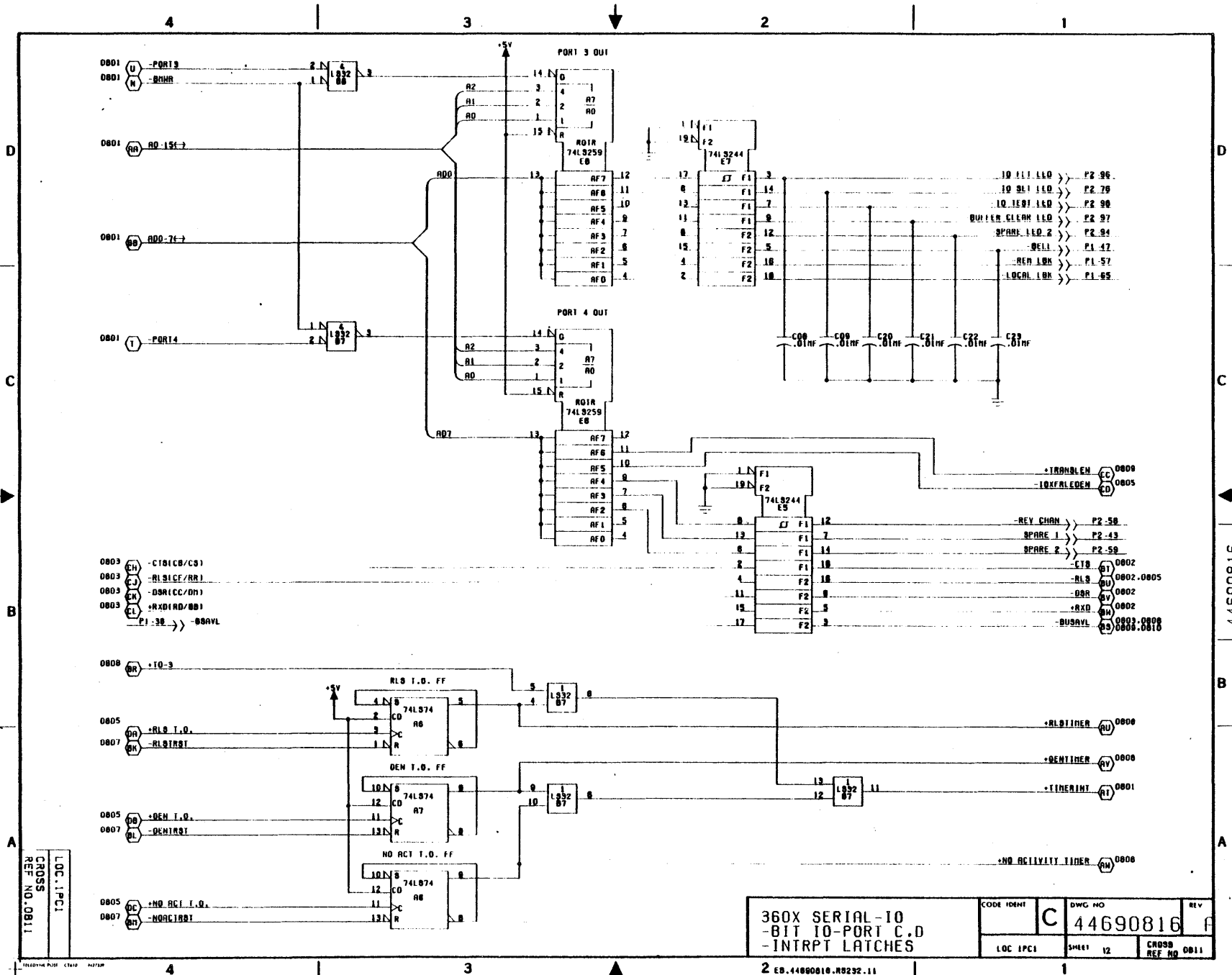
360X SERIAL-10
 -CONFIG DATA IN
 -XB ADDRESS OUT

CODE IDENT	DWG NO	REV
	C 44690816	A
LOC 1PC1	SHEET 11	CROSS REF NO 0810

2 EB.44690816.R8292.10

44690816

13-38



- 0801 U -PORT3
- 0801 W -RDRR
- 0801 RA -AD-15-
- 0801 RB -ADD-7-
- 0801 T -PORT4
- 0803 CH -CTB(CB/CS)
- 0803 CJ -BI SLCE/RR
- 0803 CH -DSR(CC/DH)
- 0803 CL -RDX(DR/DB)
- P1-38 -> -BSAVL
- 0808 BR -T0-3
- 0805 DR -RLS T.O.
- 0807 BK -RLSIRST
- 0805 DB -GEN T.O.
- 0807 BL -GENIRST
- 0805 DC -NO ACT T.O.
- 0807 BH -NOACTIRST

- IO ILL ILO >> P2-96
- IO RL ILO >> P2-79
- IO IERR ILO >> P2-90
- BUFFER CLEAR ILO >> P2-97
- SPARE ILO 2 >> P2-84
- BELL >> P1-47
- REN LOK >> P1-57
- LOCAL LOK >> P1-85

- +TRASHLEN (C) 0809
- IOXFALEGEN (C) 0805
- REV CHAN >> P2-58
- SPARE 1 >> P2-43
- SPARE 2 >> P2-59
- CTB (B) 0802
- RLS (B) 0802-0805
- DRR (B) 0802
- +RDX (B) 0802
- BUSAVL (B) 0803-0808
- +BS (B) 0808-0810
- +RLTIMER (B) 0806
- +GENTIMER (B) 0806
- +TIMERINT (B) 0801
- +NO ACTIVITY TIMER (B) 0806

LOC 1PCI
CROSS REF NO 0811

360X SERIAL-IO
-BIT IO-PORT C.D.
-INTRPT LATCHES

CODE IDENT	C	DWG NO	44690816	REV	A
LOC 1PCI	SHEET	12	CROSS REF NO	0811	

CENTRONICS PARALLEL INTERFACE PERSONALITY MODULE

Board Number

Page

44690618, 44691446, 44691861
44691973

13-40
13-57

CROSS REF NO.: 0800
 MODULE LOC: 1PC1
 SCHEMATIC NO: 44690616

PART NO: 44690617
 REV: A
 SHT: 02

MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
0102/1PC2	5V (+)	0808/P1-97
0102/1PC2	5V (+)	0808/P1-98
0102/1PC2	5V (+)	0808/P1-99
0102/1PC2	5V (+)	0808/P1-100
0103/1PC2	5V (+)	0808/P2-3
0103/1PC2	5V (+)	0808/P2-4
0101/1PC2	BSAVL (-)	0809/P1-38
0101/1PC2	CFDAT (+)	0808/P1-35
0101/1PC2	CFPLS (-)	0808/P1-37
0101/1PC2	CLK (2 MHZ) (-)	0812/P1-48
0103/1PC2	CPRST (-)	0807/P2-61
0102/6PC1	DATA BIT 1 (+)	0801/P1-55
	DATA BIT 1 RTN	0801/P1-56
0102/6PC1	DATA BIT 2 (+)	0801/P1-57
	DATA BIT 2 RTN	0801/P1-58
0102/6PC1	DATA BIT 3 (+)	0801/P1-59
	DATA BIT 3 RTN	0801/P1-60
0102/6PC1	DATA BIT 4 (+)	0801/P1-61
	DATA BIT 4 RTN	0801/P1-62
0102/6PC1	DATA BIT 5 (+)	0801/P1-63
	DATA BIT 5 RTN	0801/P1-64
0102/6PC1	DATA BIT 6 (+)	0801/P1-65
	DATA BIT 6 RTN	0801/P1-66
0102/6PC1	DATA BIT 7 (+)	0801/P1-67
	DATA BIT 7 RTN	0801/P1-68
0102/6PC1	DATA BIT 8 (+)	0801/P1-69
	DATA BIT 8 RTN	0801/P1-70
0101/6PC1	DATA STROBE (-)	0801/P1-21
	DATA STROBE RTN	0801/P1-22
0101/1PC2	ENRDY (-)	0810/P1-44
0102/1PC2	FAULT (-)	0809/P1-52
	GND	0808/P1-1
	GND	0808/P1-2
0102/1PC2	GND	0808/P1-91
0102/1PC2	GND	0808/P1-92
0102/1PC2	GND	0808/P1-95
0102/1PC2	GND	0808/P1-96
0103/1PC2	GND	0808/P2-1
0103/1PC2	GND	0808/P2-2

CROSS REF NO.: 0800
MODULE LOC: 1PC1
SCHEMATIC NO: 44690616

PART NO: 44690617
REV: A
SHT: 03

MODULE INPUTS (continued)

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
	GND	0808/P2-19
	GND	0808/P2-20
0103/1PC2	GND	0808/P2-35
0103/1PC2	GND	0808/P2-36
0103/1PC2	GND	0808/P2-37
0103/1PC2	GND	0808/P2-39
0103/1PC2	GND	0808/P2-41
	GND	0808/P2-49
	GND	0808/P2-50
0104/1PC2	GND	0808/P2-58
0104/1PC2	GND	0808/P2-59
	GND	0808/P2-69
	GND	0808/P2-70
0104/1PC2	GND	0808/P2-99
0104/1PC2	GND	0808/P2-100
0102/6PC1	INPUT PRIME (-)	0807/P1-71
0102/6PC1	INPUT PRIME RTN	0807/P1-72
0101/1PC2	PAPER ERROR (-)	0812/P1-36
0101/6PC1	PARITY BIT (+)	0801/P1-11
	PARITY BIT RTN	0801/P1-12
0102/1PC3	PWR INH (-)	0810/P1-54
0101/1PC2	START SW (-)	0807/P1-31

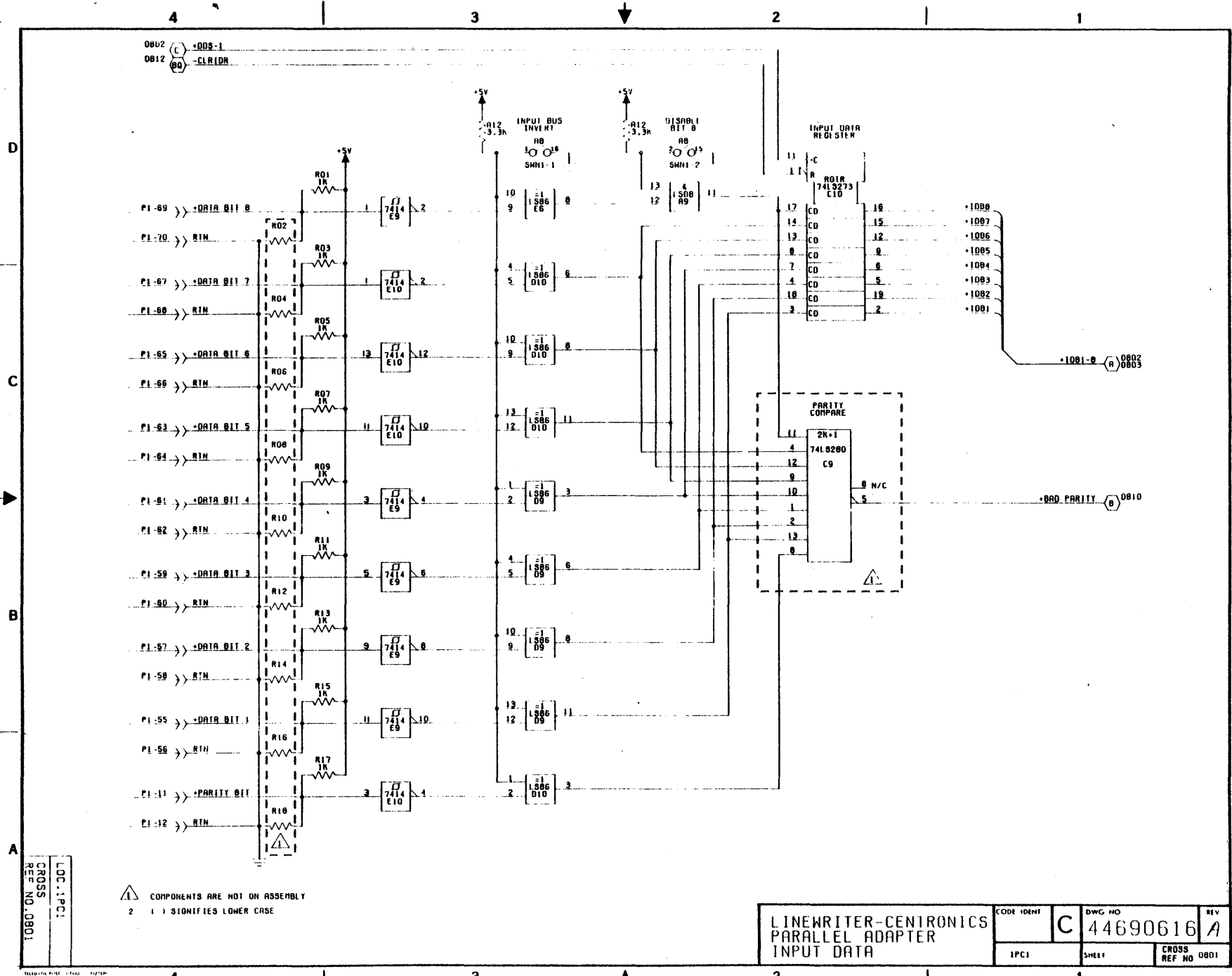
CROSS REF NO.: 0800
MODULE LOC: 1PC1
SCHEMATIC NO: 44690616

PART NO: 44690617
REV: A
SHT: 04

MODULE OUTPUTS

<u>MODULE CROSS REF NO</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
0812/P1-4	10 FLT (+)	0101/1PC2
0806/P1-45	10 LIP (-)	0101/1PC2
0812/P1-13	125 KHZ CLOCK	0101/6PC1
0812/P1-14	125 KHZ CLOCK RTN	
0812/P1-19	ACKNOWLEDGE (-)	0101/6PC1
0812/P1-20	ACKNOWLEDGE RTN	0101/6PC1
0806/P1-73	ADR 0 (+)	0102/1PC2
0806/P1-74	ADR 1 (+)	0102/1PC2
0806/P1-75	ADR 2 (+)	0102/1PC2
0806/P1-76	ADR 3 (+)	0102/1PC2
0806/P1-77	ADR 4 (+)	0102/1PC2
0806/P1-78	ADR 5 (+)	0102/1PC2
0806/P1-79	ADR 6 (+)	0102/1PC2
0806/P1-80	ADR 7 (+)	0102/1PC2
0806/P1-81	ADR 8 (+)	0102/1PC2
0806/P1-82	ADR 9 (+)	0102/1PC2
0808/P1-47	BEL PULSE (-)	0101/5PC1
0812/P1-7	BUSY (+)	0101/6PC1
0812/P1-8	BUSY RTN	
0812/P1-9	COMPRESSED PITCH (+)	0101/6PC1
0812/P1-10	COMPRESSED PITCH RTN	
0811/P1-42	CURD (-)	0101/1PC2
0811/P1-40	CUWR (-)	0101/1PC2
0804/P1-23	DB0 (+)	0101/1PC2
0804/P1-24	DB1 (+)	0101/1PC2
0804/P1-25	DB2 (+)	0101/1PC2
0804/P1-26	DB3 (+)	0101/1PC2
0804/P1-27	DB4 (+)	0101/1PC2
0804/P1-28	DB5 (+)	0101/1PC2
0804/P1-29	DB6 (+)	0101/1PC2
0804/P1-30	DB7 (+)	0101/1PC2
0812/P1-46	EXADV (-)	0101/1PC2
0812/P1-5	FAULT (-)	0101/6PC1
0812/P1-6	FAULT RTN	
0808/P1-41	LDCMPL (-)	0101/1PC2
0808/P1-39	LDEVFU (-)	0101/1PC2
0812/P1-34	MEMCS (-)	0101/1PC2
0812/P1-17	OUT OF PAPER (+)	0101/6PC1
0812/P1-18	OUT OF PAPER RTN	
0812/P1-15	SELECT (+)	0101/6PC1
0812/P1-16	SELECT RTN	
0808/P1-33	SSPLS (-)	0101/1PC2
0810/P1-3	START LAMP (-)	0101/1PC2
0808/P1-32	STREQ (-)	0101/1PC2

13-44



D
C
B
A

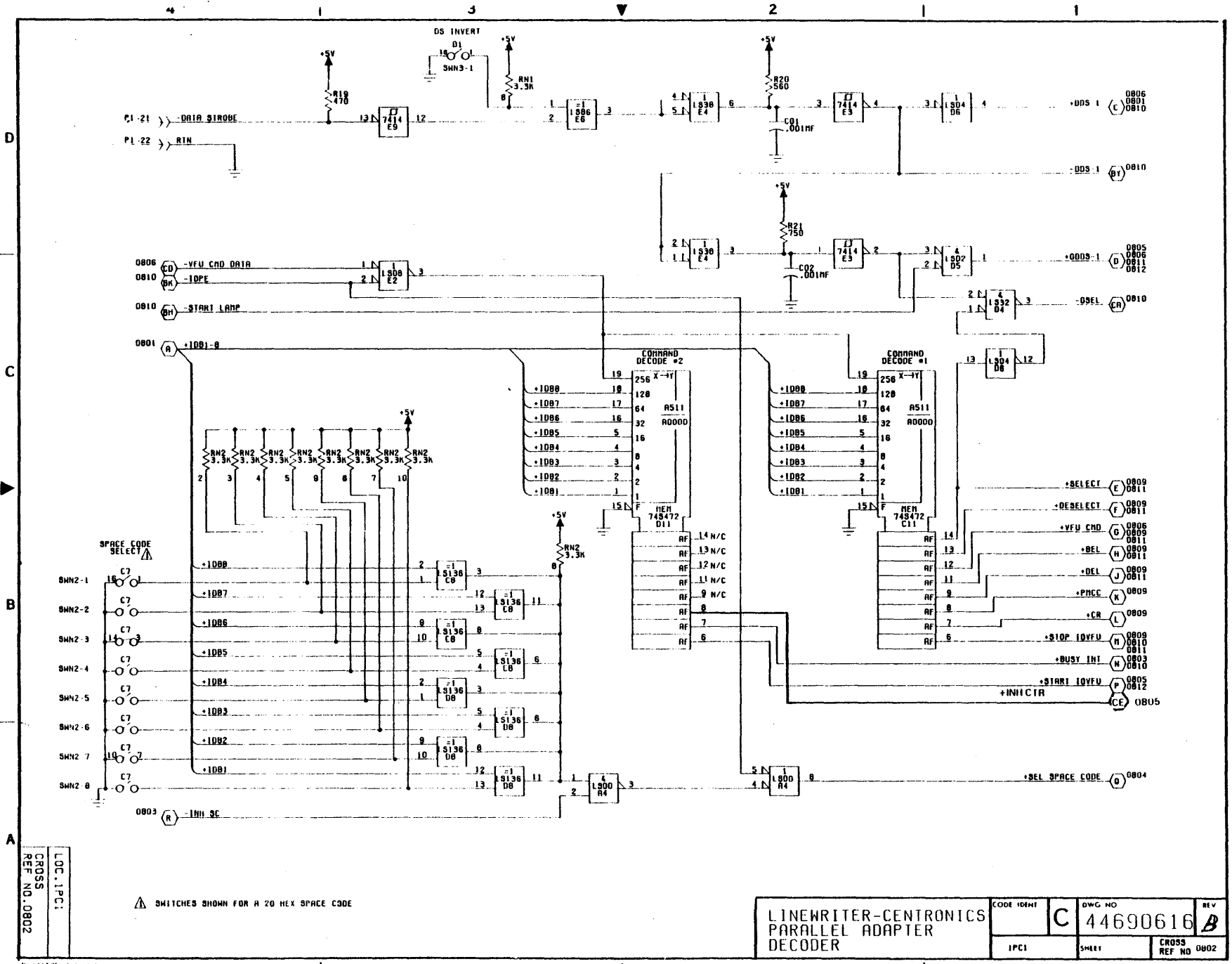
LOC. 1-IPC1
CROSS
REF. NO. 0801

△ COMPONENTS ARE NOT ON ASSEMBLY
2 1) SIGNIFIES LOWER CASE

LINEWRITER-CENTRONICS
PARALLEL ADAPTER
INPUT DATA

CODE IDENT	C	DWG NO	44690616	REV	A
IPC1	SHEET	CROSS REF NO	0801		

13-45

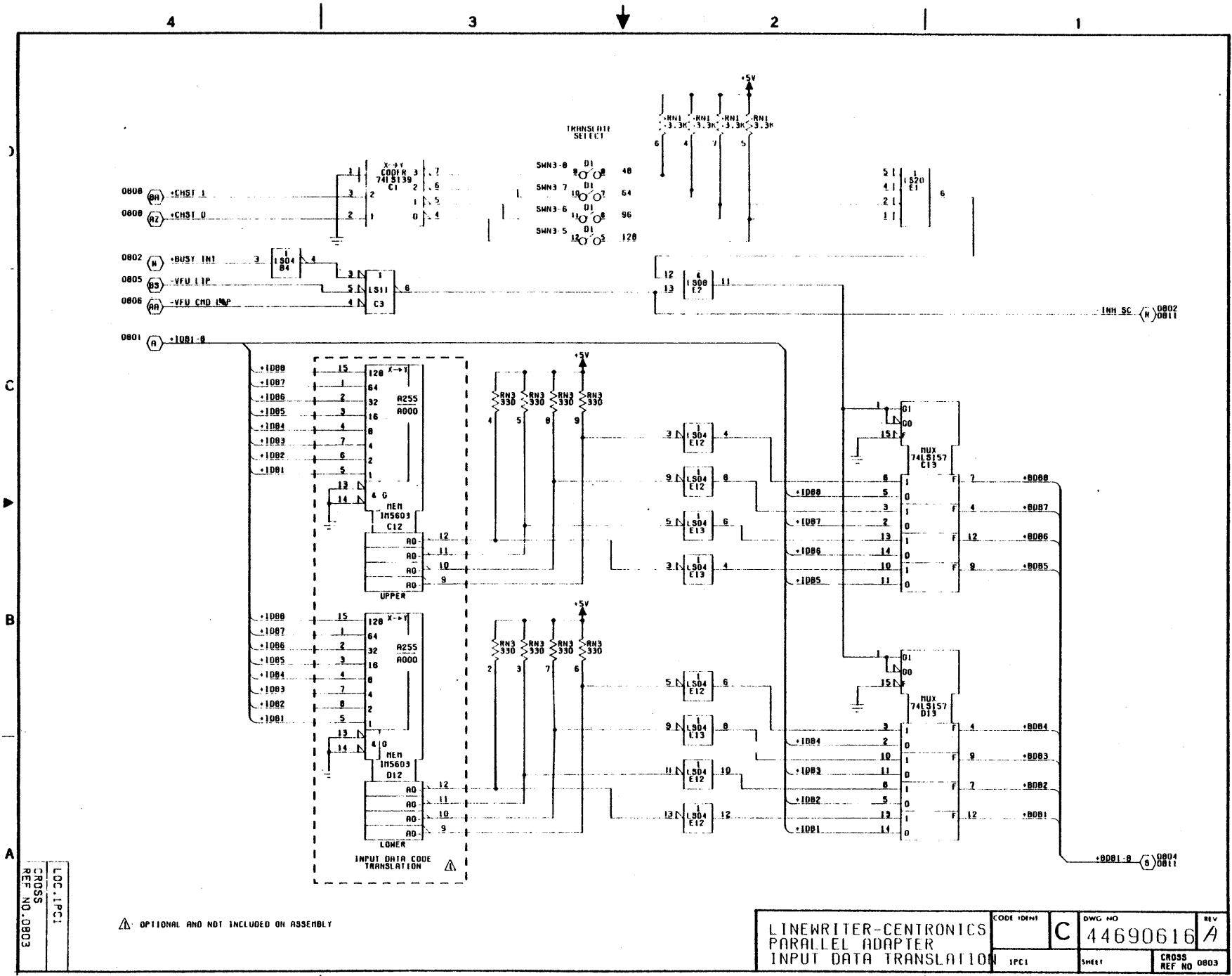


LOC. 1 PC1
 CROSS REF. NO. 0802

SWITCHES SHOWN FOR A 20 HEX SPACE CODE

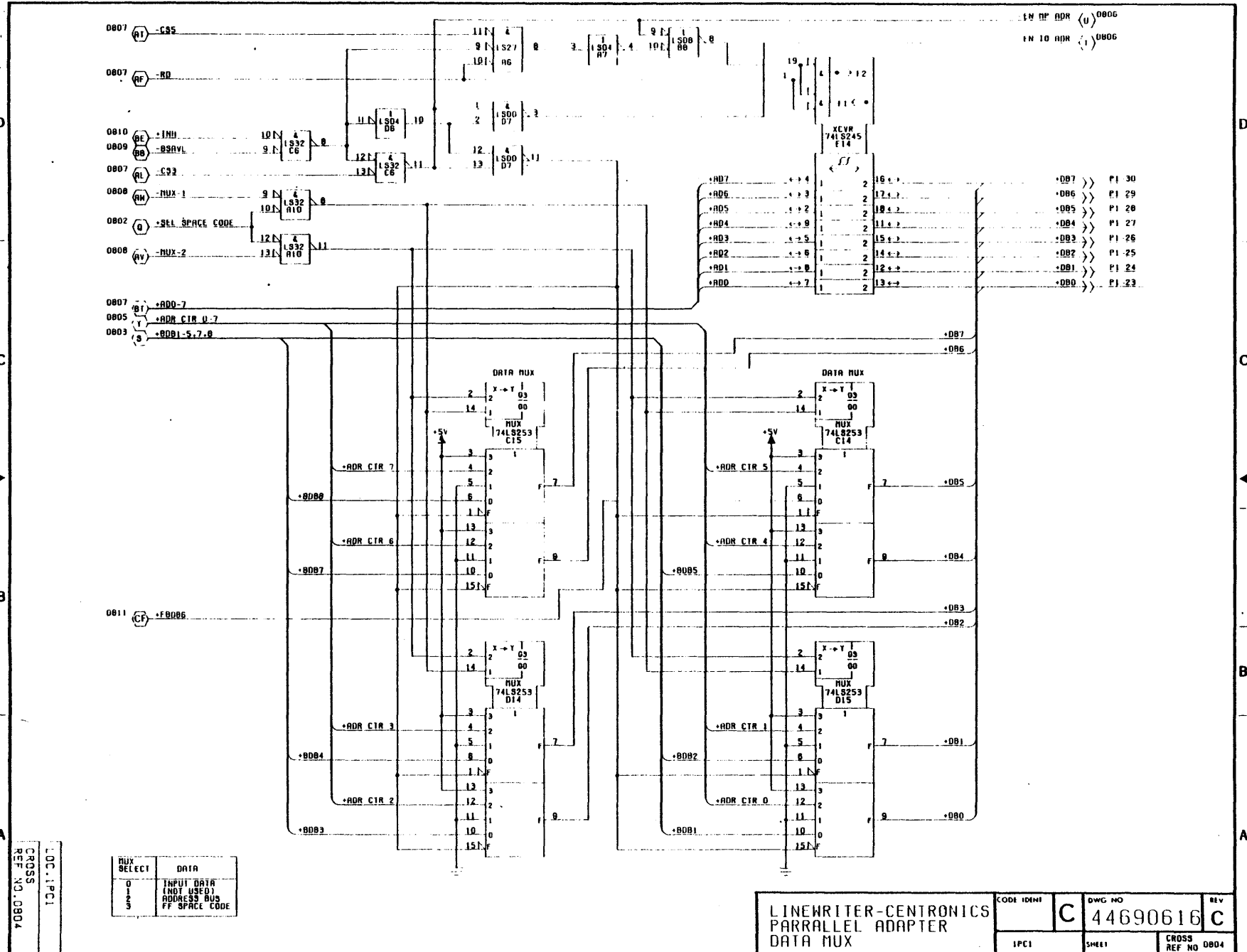
LINEWRITER-CENTRONICS PARALLEL ADAPTER DECODER		CODE IDENT C	DWG NO 44690616	REV B
IPC1	SMER1	CROSS REF NO 0802		

13-46



13-46

44690616



LN 00 ADR (U) 0806
LN 10 ADR (I) 0806

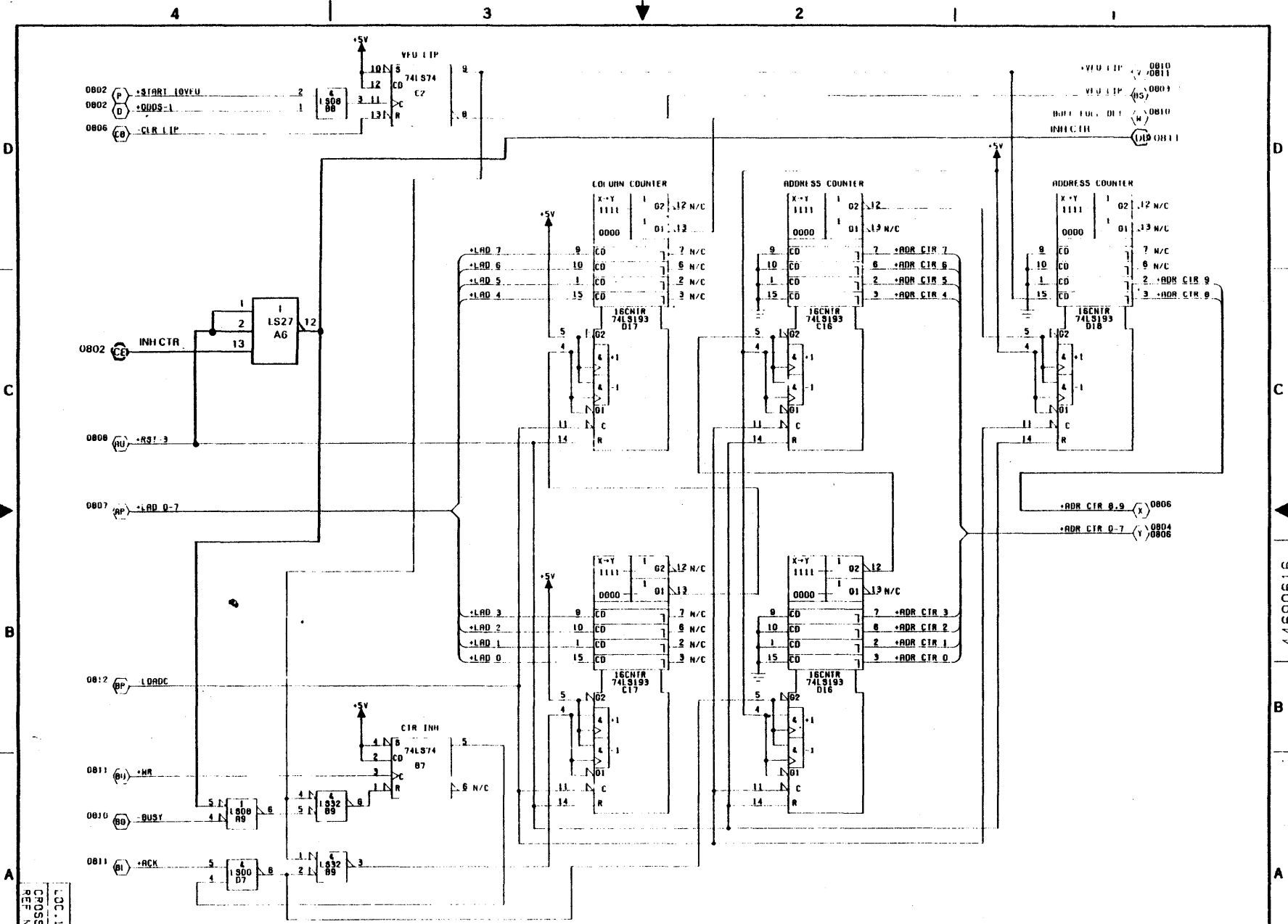
13-47

LOC: IPC1
CROSS REF NO: 0804

MUX SELECT	DATA
0	INPUT DATA
1	INPUT DATA (NOT USED)
2	ADDRESS BUS
3	FF SPACE CODE

LINEWRITER-CENTRONICS PARALLEL ADAPTER DATA MUX		CODE IDENT IPC1	C	DWG NO 44690616	REV C
		SHEET	CROSS REF NO	0804	

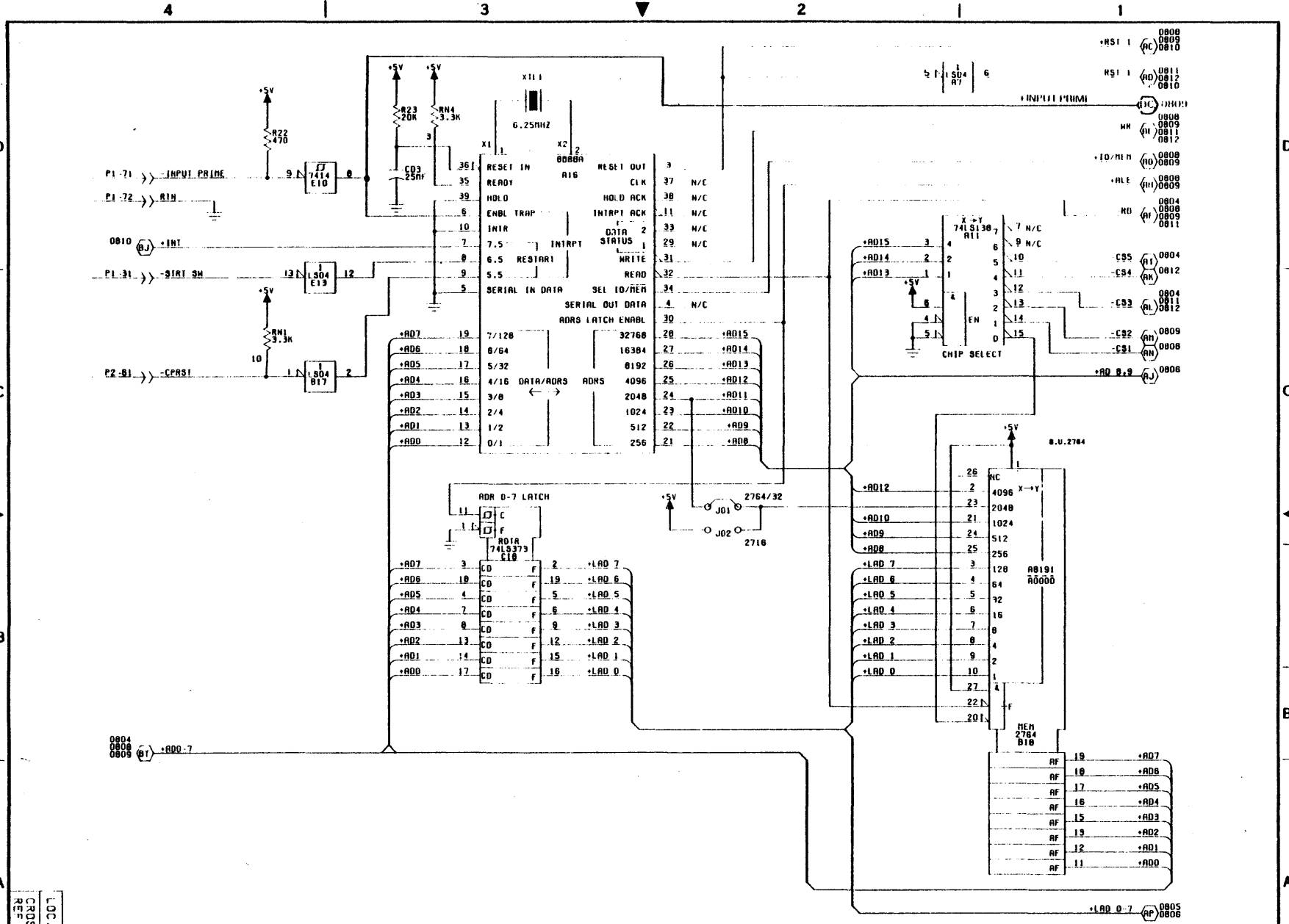
13-48



IPC1
 CROSS
 REF NO. 0805

LINEWRITER-CENTRONICS PARALLEL ADAPTER ADDRESS COUNTER		CODE IDENT C	DWG NO 44690616	REV B
IPC1	SHEET	CROSS REF NO 0805		

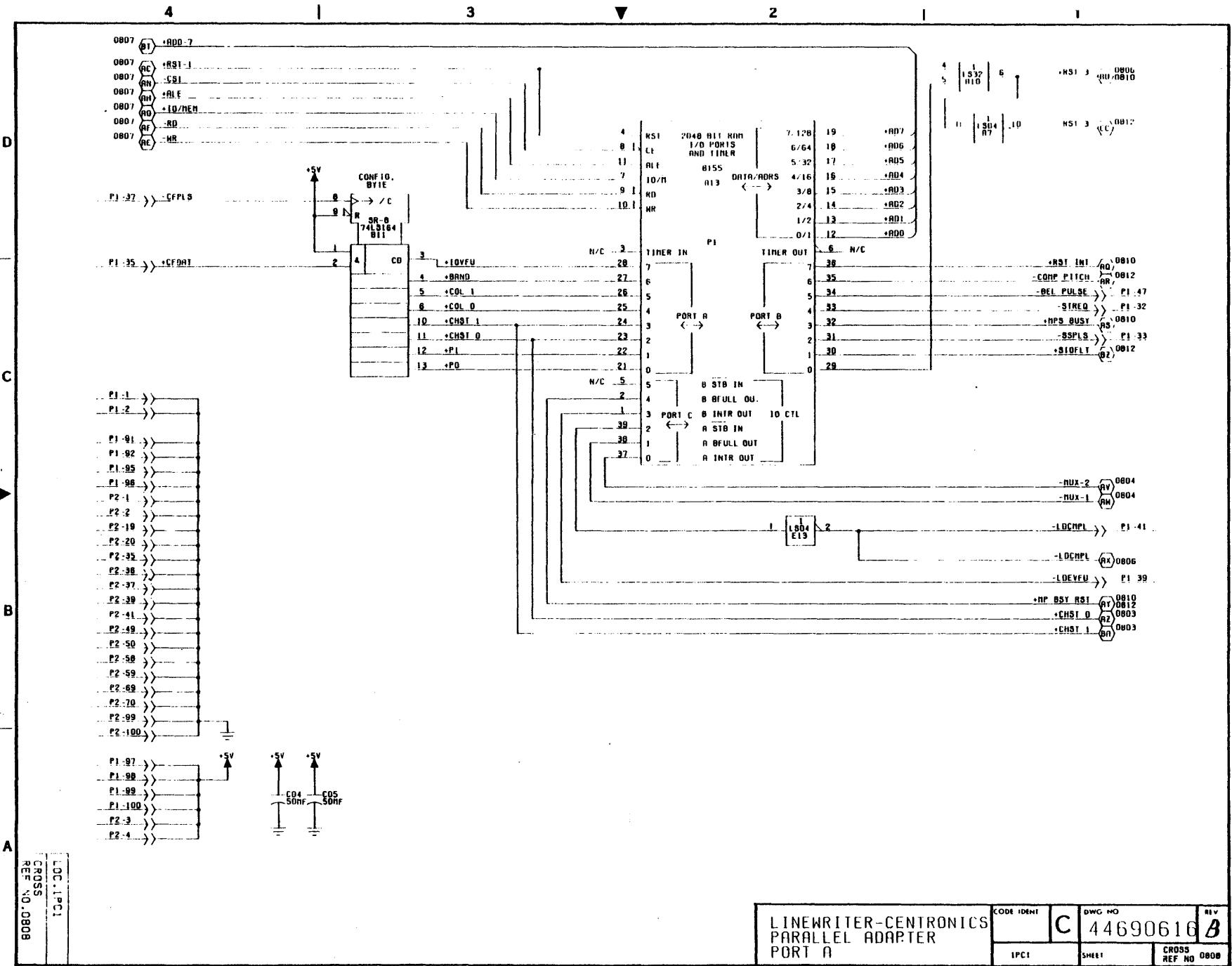
13-50



LOC: 1PC1
 CROSS REF NO: 0807

LINEWRITER-CENTRONICS PARALLEL ADAPTER MICROPROCESSOR		CODE IDENT C	DWG NO 44690616	REV B
1PC1	SHEET	CROSS REF NO 0807		

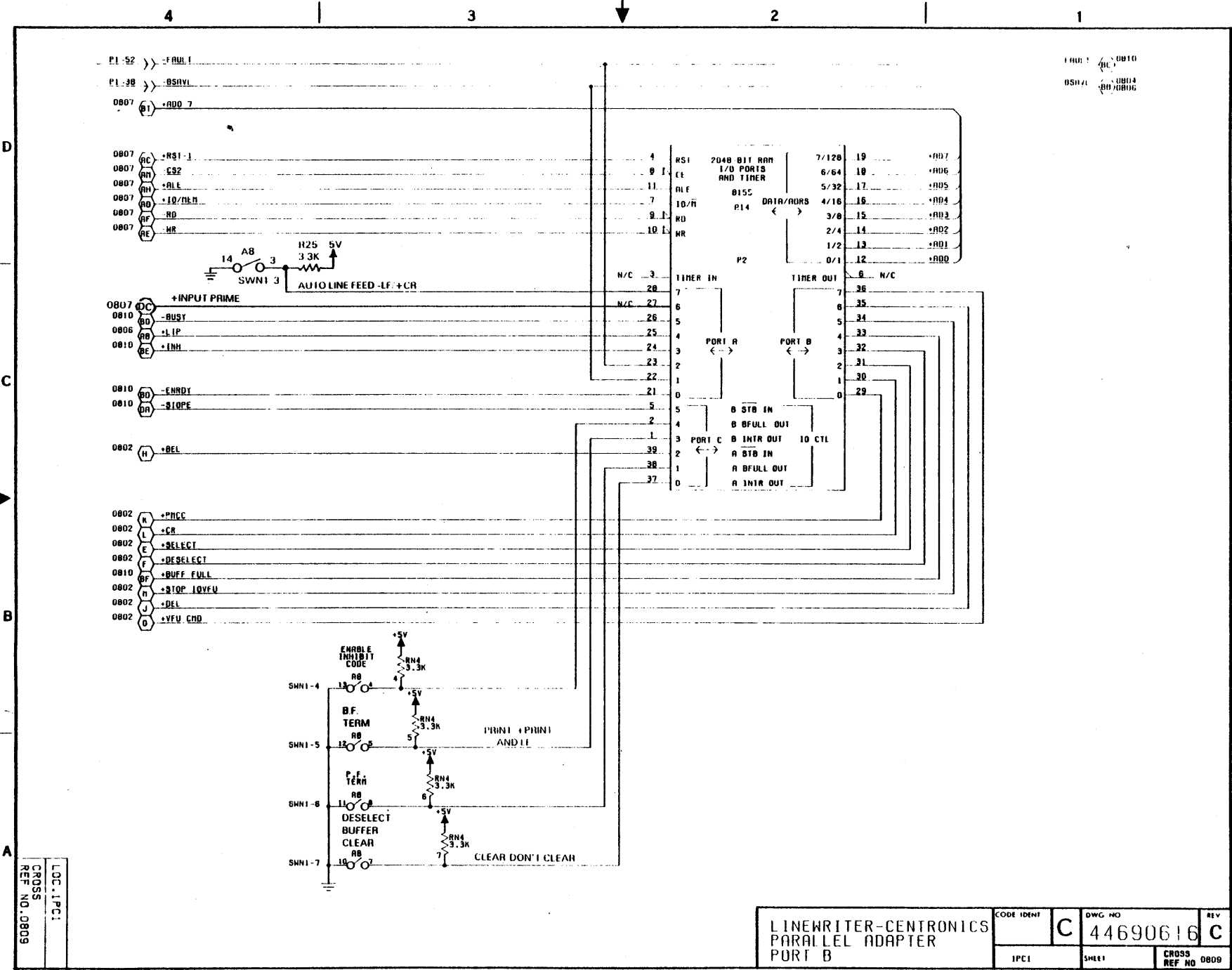
13-51



LOC. IPC1
 CROSS
 REF. NO. 0808

LINEWRITER-CENTRONICS PARALLEL ADAPTER PORT A		CODE IDENT C	DWG NO 44690616	REV B
IPC1	SHEET	CROSS REF NO 0808		

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LOC: JFC:
CROSS
REF NO: 0809

LINEWRITER-CENTRONICS PARALLEL ADAPTER PORT B		CODE IDENT	DWG NO	REV
			C 44690616	C
IPC1	SHEET	CROSS REF NO 0809		

13-53

D

C

B

A

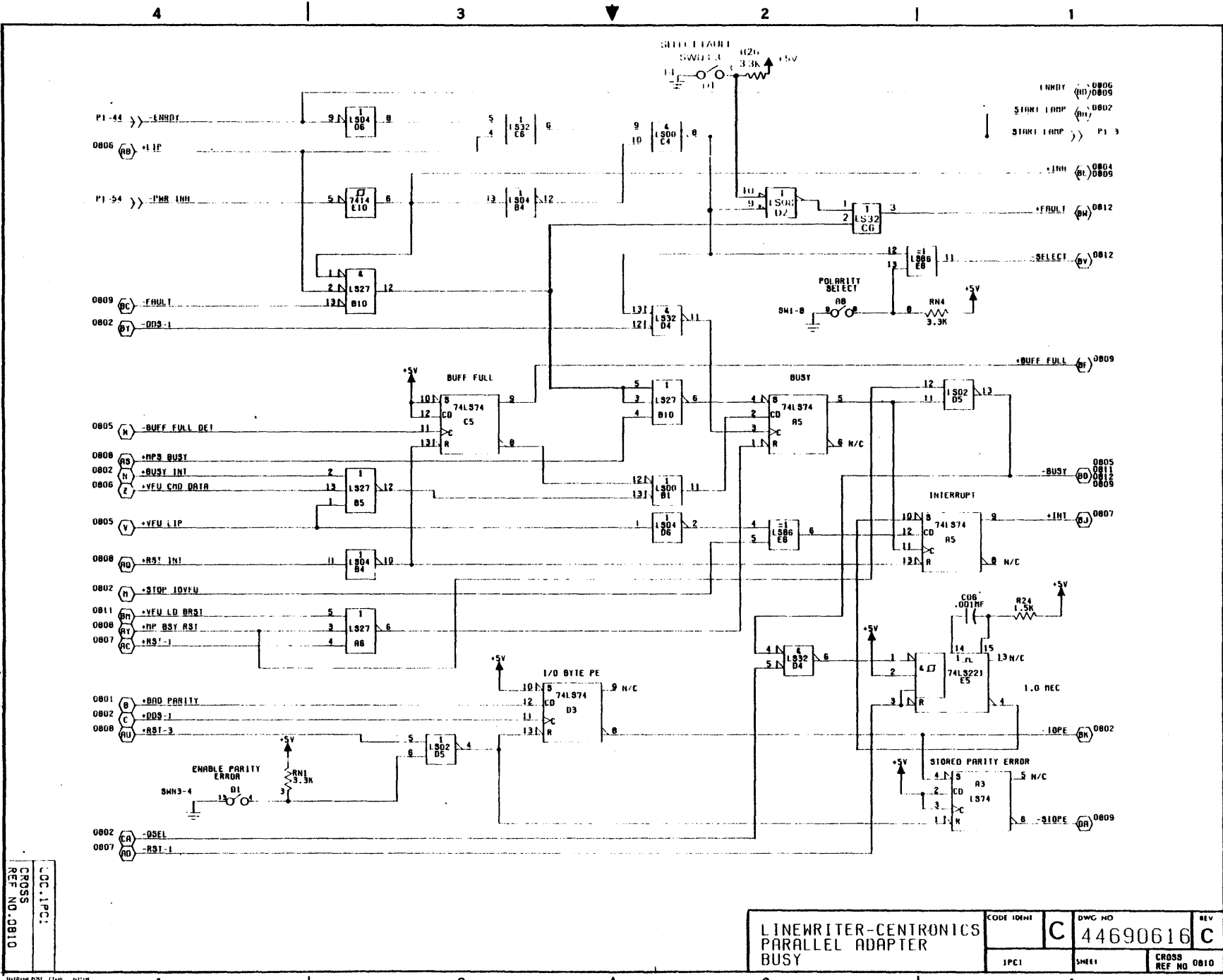
D

C

B

A

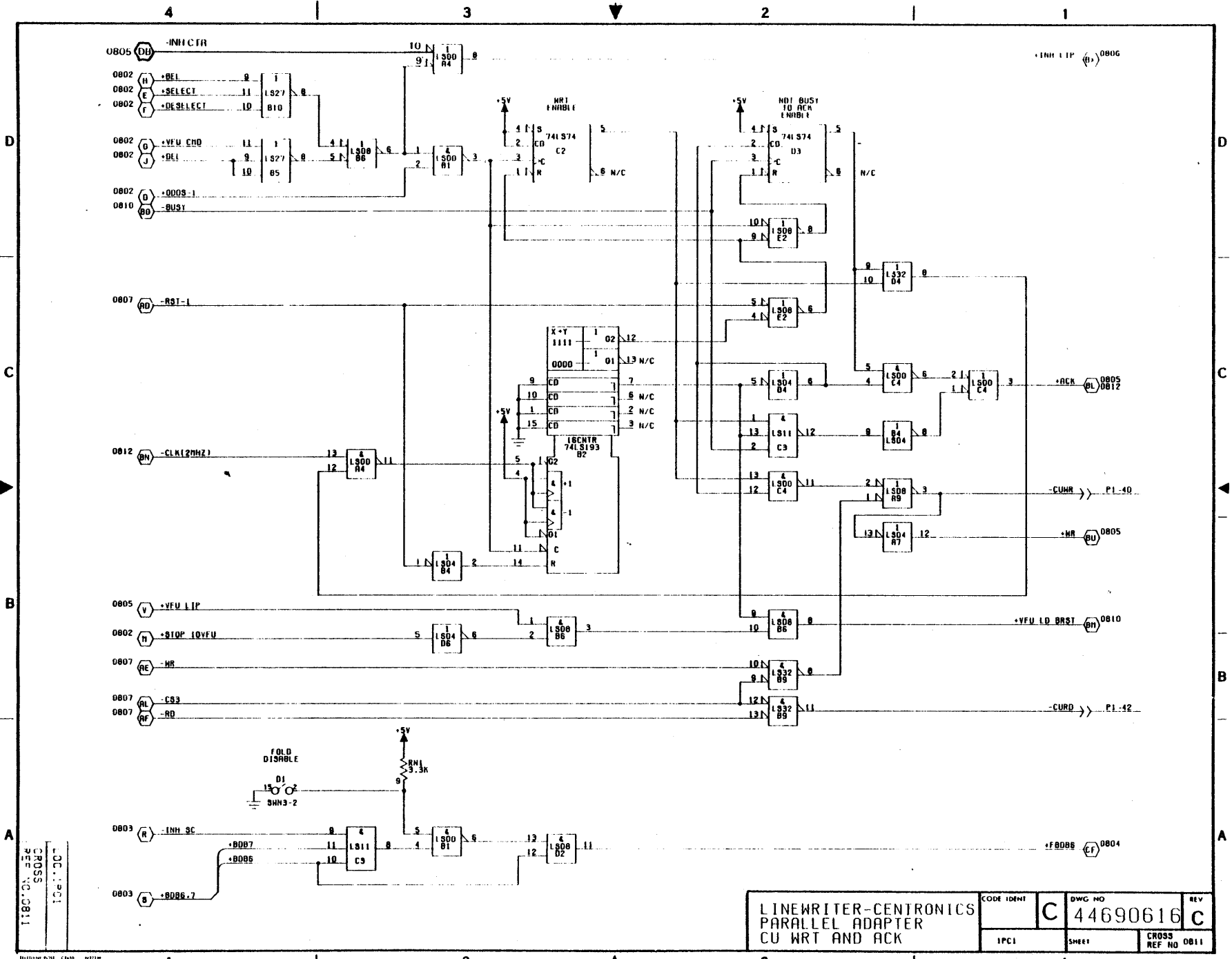
44690616



LOC. 1 P.C.I.
 CROSS
 REF. NO. 0810

LINEWRITER-CENTRONICS PARALLEL ADAPTER BUSY		CODE IDENT C	DWC NO 44690616	REV C
		IPC1	SM41	CROSS REF. NO 0810

13-54

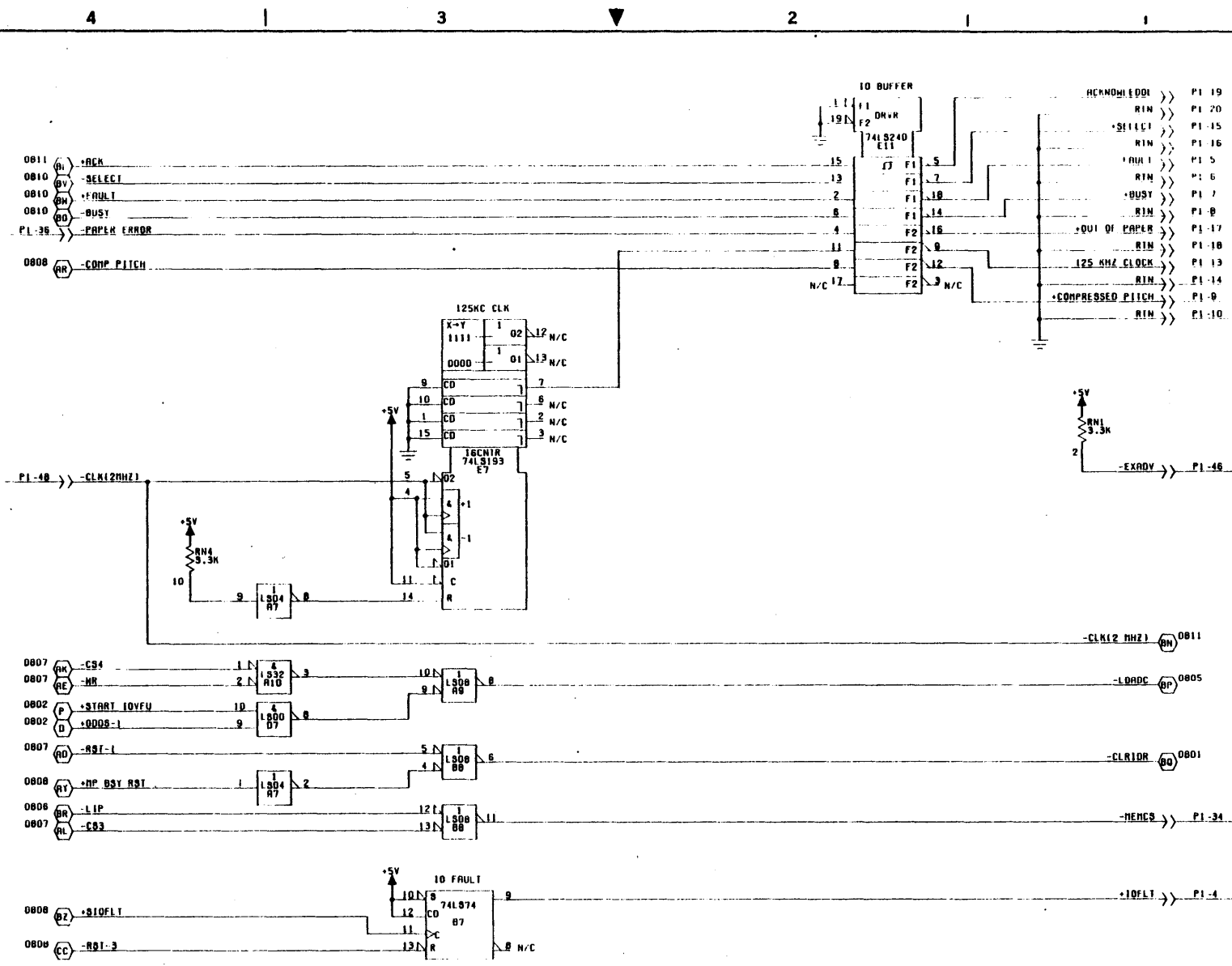


LOC: 1-PC1
 CROSS REF: C.0811

LINEWRITER-CENTRONICS
 PARALLEL ADAPTER
 CU WRT AND ACK

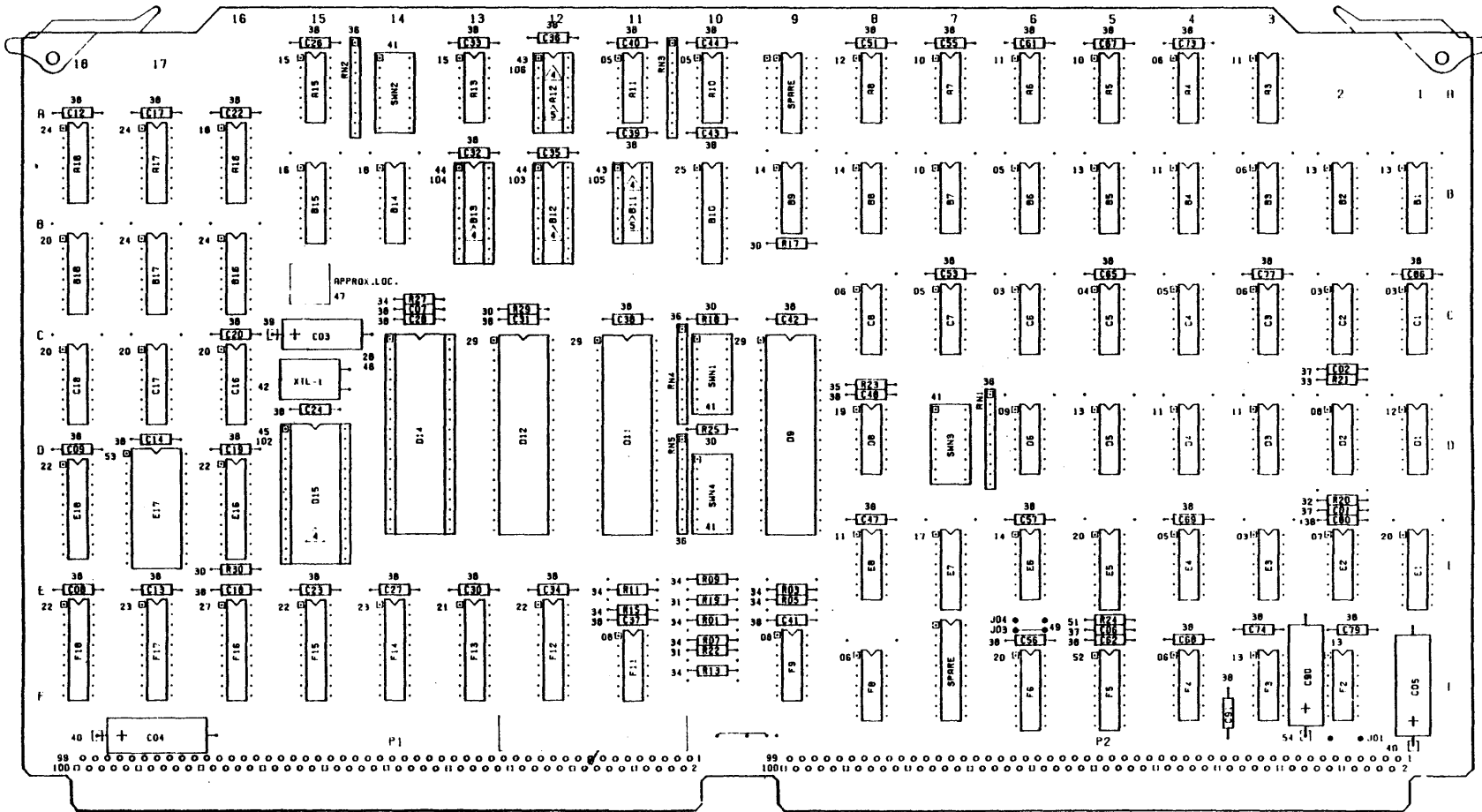
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IPC1		SHEET		CROSS REF NO	0811

13-55/13-56



LOC. IPC1
 CROSS
 REF. NO. 0812

LINEWRITER-CENTRONICS PARALLEL ADAPTER IO BUFFER		CODE IDENT C	DWG NO 44690616	REV A
IPC1	SHEET	CROSS REF NO 0812		



CENTRONICS PARALLEL INTERFACE PERSONALITY MODULE

CROSS REF NO.: 0800
 MODULE LOC: 1PC1
 SCHEMATIC NO: 44691969

PART NO: 44691970
 REV: A
 SHT: 2

MODULE INPUTS

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
0200/1PC2	5V (+)	0808/P1-97
0200/1PC2	5V (+)	0808/P1-98
0200/1PC2	5V (+)	0808/P1-99
0200/1PC2	5V (+)	0808/P1-100
0200/1PC2	5V (+)	0808/P2-3
0200/1PC2	5V (+)	0808/P2-4
0200/1PC2	BSAVL (-)	0809/P1-30
0200/1PC2	CFDAT (+)	0808/P1-35
0200/1PC2	CFPLS (-)	0808/P1-37
0200/1PC2	CLK (2 MHZ)	0812/P1-48
0200/1PC2	CPRST (-)	0807/P2-61
0700/6PC1	DATA BIT 1 (+)	0801/P1-55
0700/6PC1	DATA BIT 1 RTN	0801/P1-56
0700/6PC1	DATA BIT 2 (+)	0801/P1-57
0700/6PC1	DATA BIT 2 RTN	0801/P1-58
0700/6PC1	DATA BIT 3 (+)	0801/P1-59
0700/6PC1	DATA BIT 3 RTN	0801/P1-60
0700/6PC1	DATA BIT 4 (+)	0801/P1-61
0700/6PC1	DATA BIT 4 RTN	0801/P1-62
0700/6PC1	DATA BIT 5 (+)	0801/P1-63
0700/6PC1	DATA BIT 5 RTN	0801/P1-64
0700/6PC1	DATA BIT 6 (+)	0801/P1-65
0700/6PC1	DATA BIT 6 RTN	0801/P1-66
0700/6PC1	DATA BIT 7 (+)	0801/P1-67
0700/6PC1	DATA BIT 7 RTN	0801/P1-68
0700/6PC1	DATA BIT 8 (+)	0801/P1-69
0700/6PC1	DATA BIT 8 RTN	0801/P1-70
0700/6PC1	DATA STROBE (+)	0802/P1-21
0700/6PC1	DATA STROBE RTN	0802/P1-22
0200/1PC2	ENRDY (-)	0810/P1-44
0200/1PC2	FAULT (-)	0809/P1-52
0200/1PC2	GND	0808/P1-1
0200/1PC2	GND	0808/P1-2
0200/1PC2	GND	0808/P1-91
0200/1PC2	GND	0808/P1-92
0200/1PC2	GND	0808/P1-95
0200/1PC2	GND	0808/P1-96
0200/1PC2	GND	0808/P2-1
0200/1PC2	GND	0808/P2-2

CROSS REF NO.: 0800
MODULE LOC: 1PC1
SCHEMATIC NO: 44691969

PART NO: 44691969
REV: A
SHT: 3

MODULE INPUTS (continued)

<u>SOURCE</u>	<u>SIGNAL NAME</u>	<u>MODULE CROSS REF NO.</u>
	GND	0808/P2-19
	GND	0808/P2-20
0103/1PC2	GND	0808/P2-35
0103/1PC2	GND	0808/P2-36
0103/1PC2	GND	0808/P2-37
0103/1PC2	GND	0808/P2-39
0103/1PC2	GND	0808/P2-41
0103/1PC2	GND	0808/P2-49
0103/1PC2	GND	0808/P2-50
0104/1PC2	GND	0808/P2-58
0104/1PC2	GND	0808/P2-59
0104/1PC2	GND	0808/P2-69
0104/1PC2	GND	0808/P2-70
0104/1PC2	GND	0808/P2-99
0104/1PC2	GND	0808/P2-100
0102/6PC1	INPUT PRIME (-)	0807/P1-71
0102/6PC1	INPUT PRIME RTN	0807/P1-72
0101/1PC2	PAPER ERROR (-)	0812/P1-35
0102/1PC3	PWR INH (-)	0810/P1-54
0101/1PC2	START SW (-)	0807/P1-31
0103/1PC3	VPWRI	0814/P2-7
0103/1PC3	VPWRI	0814/P2-8

CROSS REF NO.: 0800
MODULE LOC: 1PC1
SCHEMATIC NO: 44691969

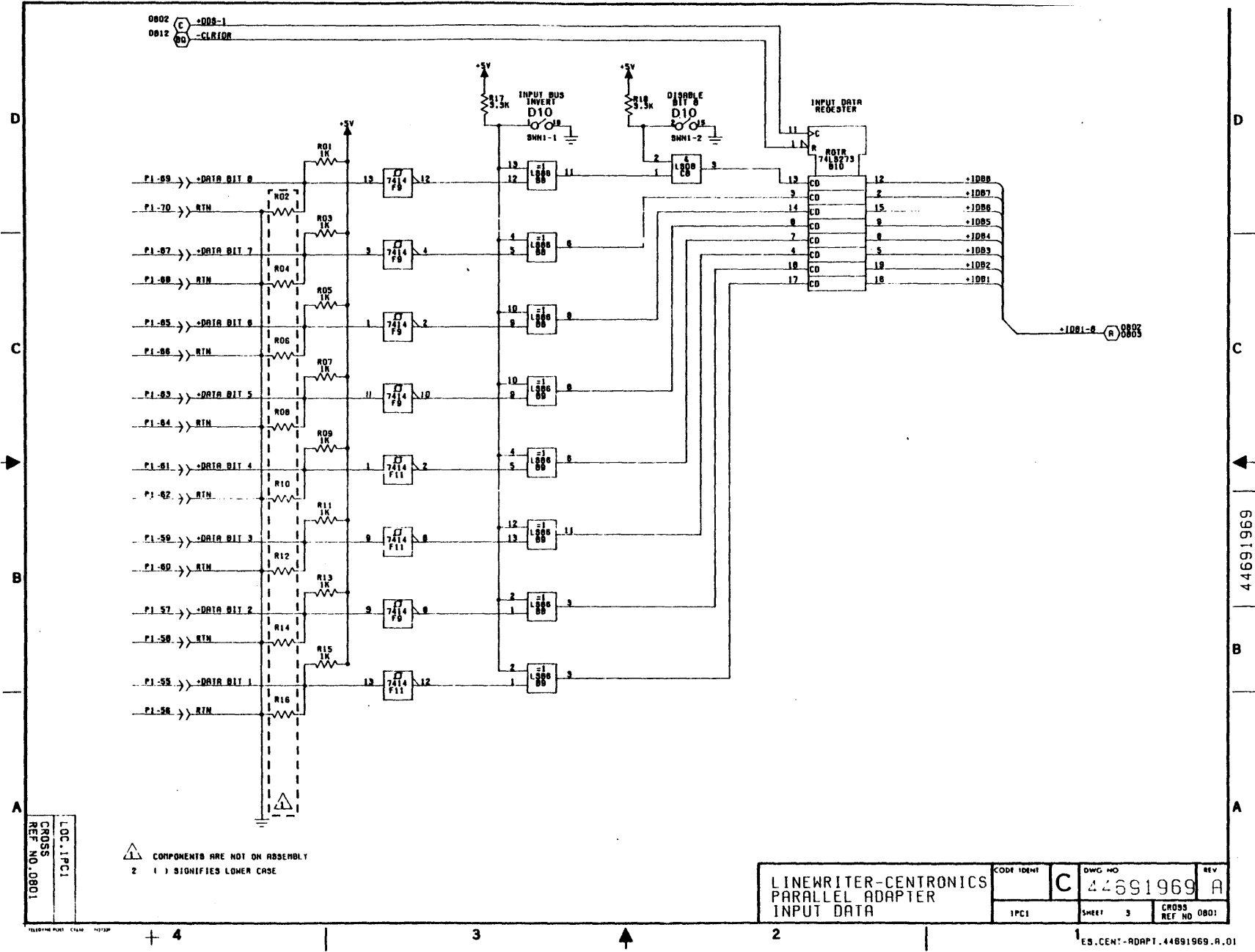
PART NO: 44691970
REV: A
SHT: 4

MODULE OUTPUTS

<u>MODULE CROSS REF NO</u>	<u>SIGNAL NAME</u>	<u>DESTINATION</u>
0812/P1-4	1/O FLT (+)	0200/1PC2
0808/P1-45	1/O LIP (-)	0200/1PC2
0812/P1-13	125 KHZ CLOCK	0700/6PC1
0812/P1-14	125 KHZ CLOCK RTN	
0812/P1-19	ACKNOWLEDGE (-)	0700/6PC1
0812/P1-20	ACKNOWLEDGE RTN	0700/6PC1
0813/P1-73	CADR 0 (+)	0200/1PC2
0813/P1-74	CADR 1 (+)	0200/1PC2
0813/P1-75	CADR 2 (+)	0200/1PC2
0813/P1-76	CADR 3 (+)	0200/1PC2
0813/P1-77	CADR 4 (+)	0200/1PC2
0813/P1-78	CADR 5 (+)	0200/1PC2
0813/P1-79	CADR 6 (+)	0200/1PC2
0813/P1-80	CADR 7 (+)	0200/1PC2
0813/P1-81	CADR 8 (+)	0200/1PC2
0813/P1-82	CADR 9 (+)	0200/1PC2
0808/P1-47	BEL PULSE (-)	0500/5PC1
0812/P1-7	BUSY (+)	0700/6PC1
0812/P1-8	BUSY RTN	
0811/P1-42	CRD (-)	0200/1PC2
0811/P1-40	CWR (-)	0200/1PC2
0813/P1-23	CDB0 (+)	0200/1PC2
0813/P1-24	CDB1 (+)	0200/1PC2
0813/P1-25	CDB2 (+)	0200/1PC2
0813/P1-26	CDB3 (+)	0200/1PC2
0813/P1-27	CDB4 (+)	0200/1PC2
0813/P1-28	CDB5 (+)	0200/1PC2
0813/P1-29	CDB6 (+)	0200/1PC2
0813/P1-30	CDB7 (+)	0200/1PC2
0812/P1-46	EXADV (-)	0200/1PC2
0812/P1-5	FAULT (-)	0700/6PC1
0812/P1-6	FAULT RTN	
0808/P1-41	LDCMPL (-)	0200/1PC2
0808/P1-39	LDEVFU (-)	0200/1PC2
0812/P1-34	MEMCS (-)	0200/1PC2
0812/P1-17	OUT OF PAPER (+)	0700/6PC1
0812/P1-18	OUT OF PAPER RTN	
0812/P1-15	SELECT (+)	0700/6PC1
0812/P1-16	SELECT RTN	
0808/P1-33	SSPLS (-)	0200/1PC2
0810/P1-3	START LAMP (-)	0200/1PC2
0808/P1-32	STREQ (-)	0200/1PC2
0814/P2-43	VPWR0	0103/6PC1

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JAN, '85



LOC. 1PC1
CROSS
REF. NO. 0801

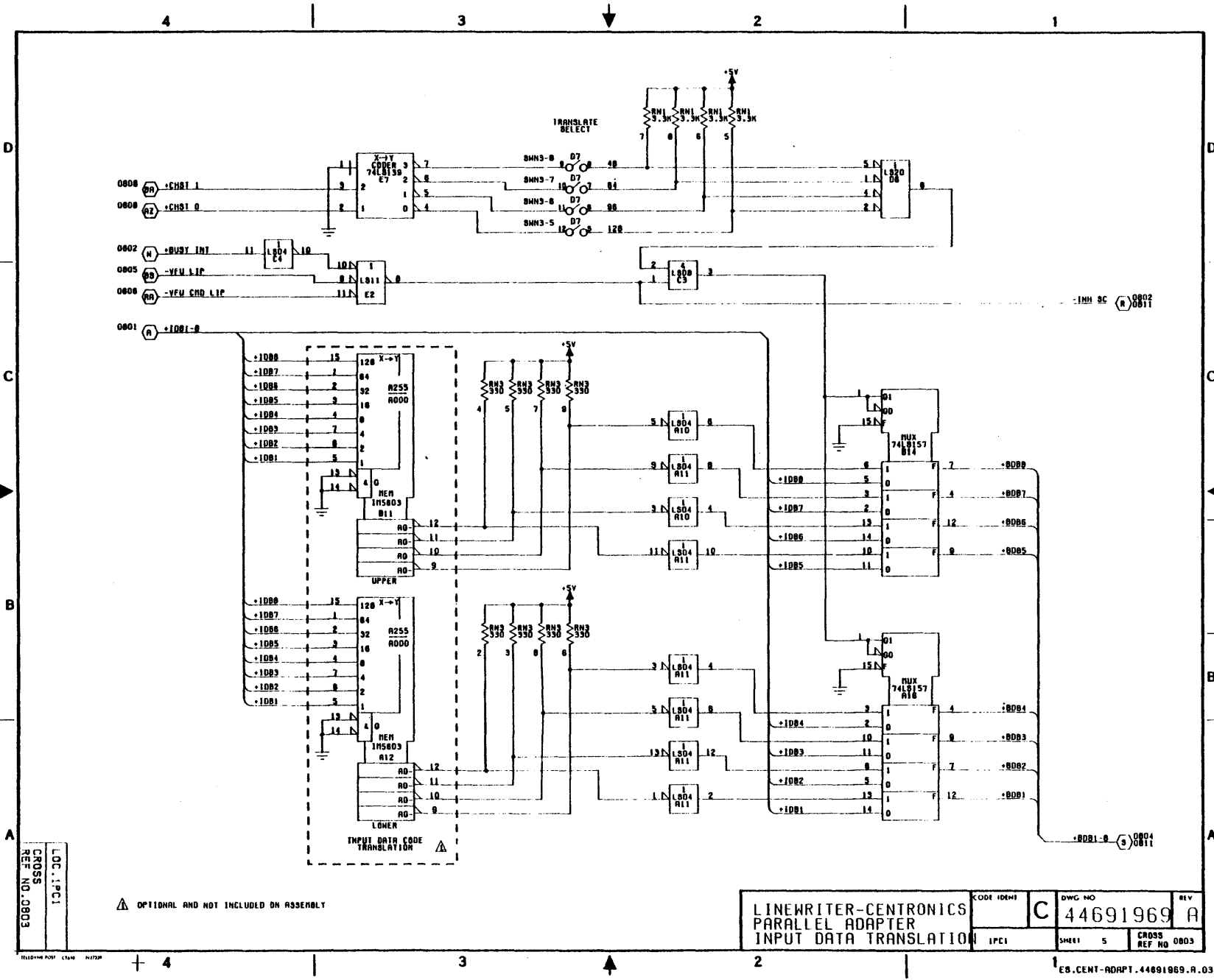
△ COMPONENTS ARE NOT ON ASSEMBLY
2 () SIGNIFIES LOWER CASE

LINEWRITER-CENTRONICS
PARALLEL ADAPTER
INPUT DATA

CODE IDENT	C	DWG. NO.	44691969	REV.	A
1PC1		SHEET	3	CROSS REF. NO.	0801

ES.CENT-ADAPT.44691969.A.01

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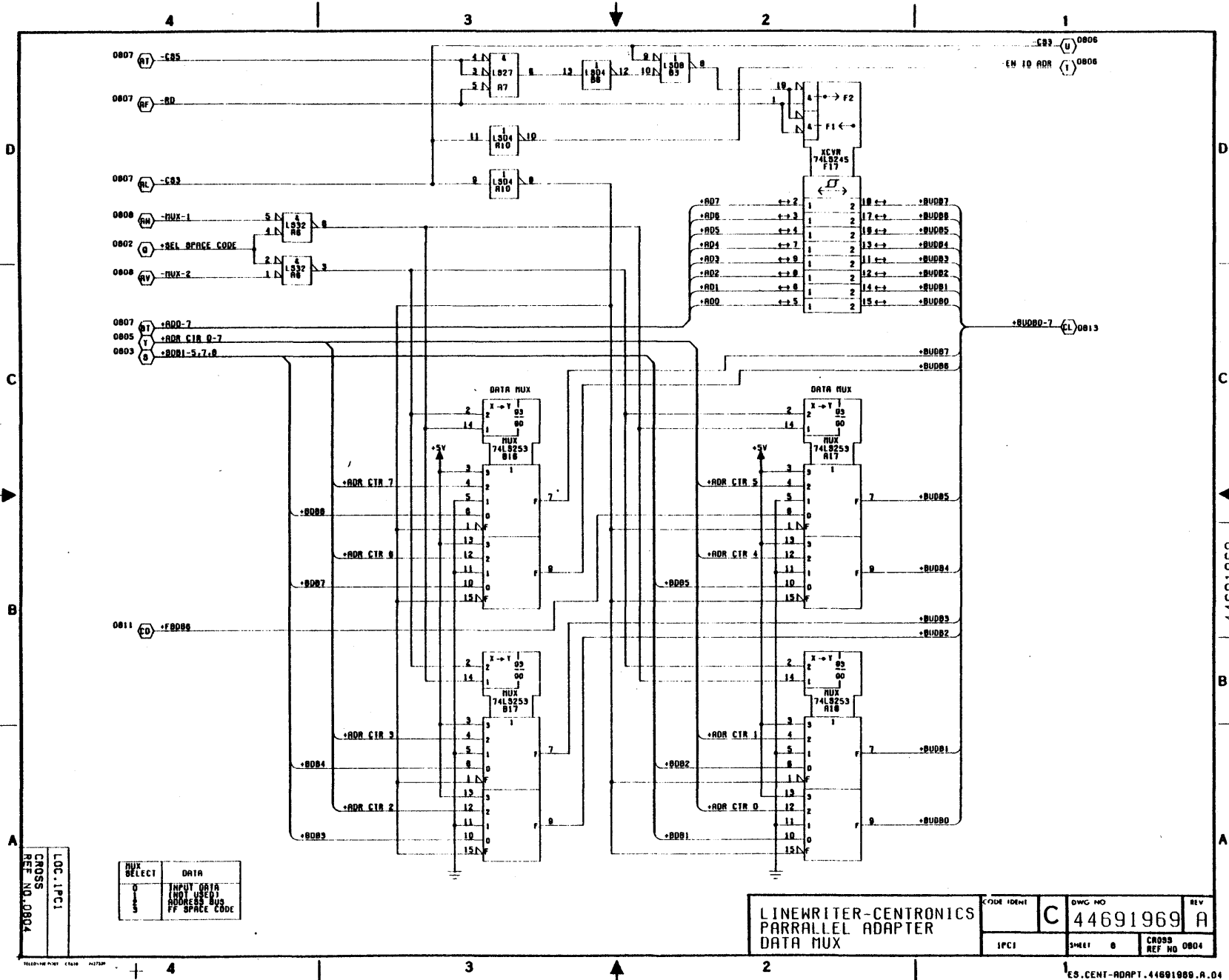
OPTIONAL AND NOT INCLUDED ON ASSEMBLY

LOC: IFC1
CROSS
REF NO: 0803

LINEWRITER-CENTRONICS PARALLEL ADAPTER INPUT DATA TRANSLATION		CODE IDENTIFIER IFC1	DWG NO C 44691969 A	REV A
		SHEET 5	CROSS REF NO 0803	

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13-64



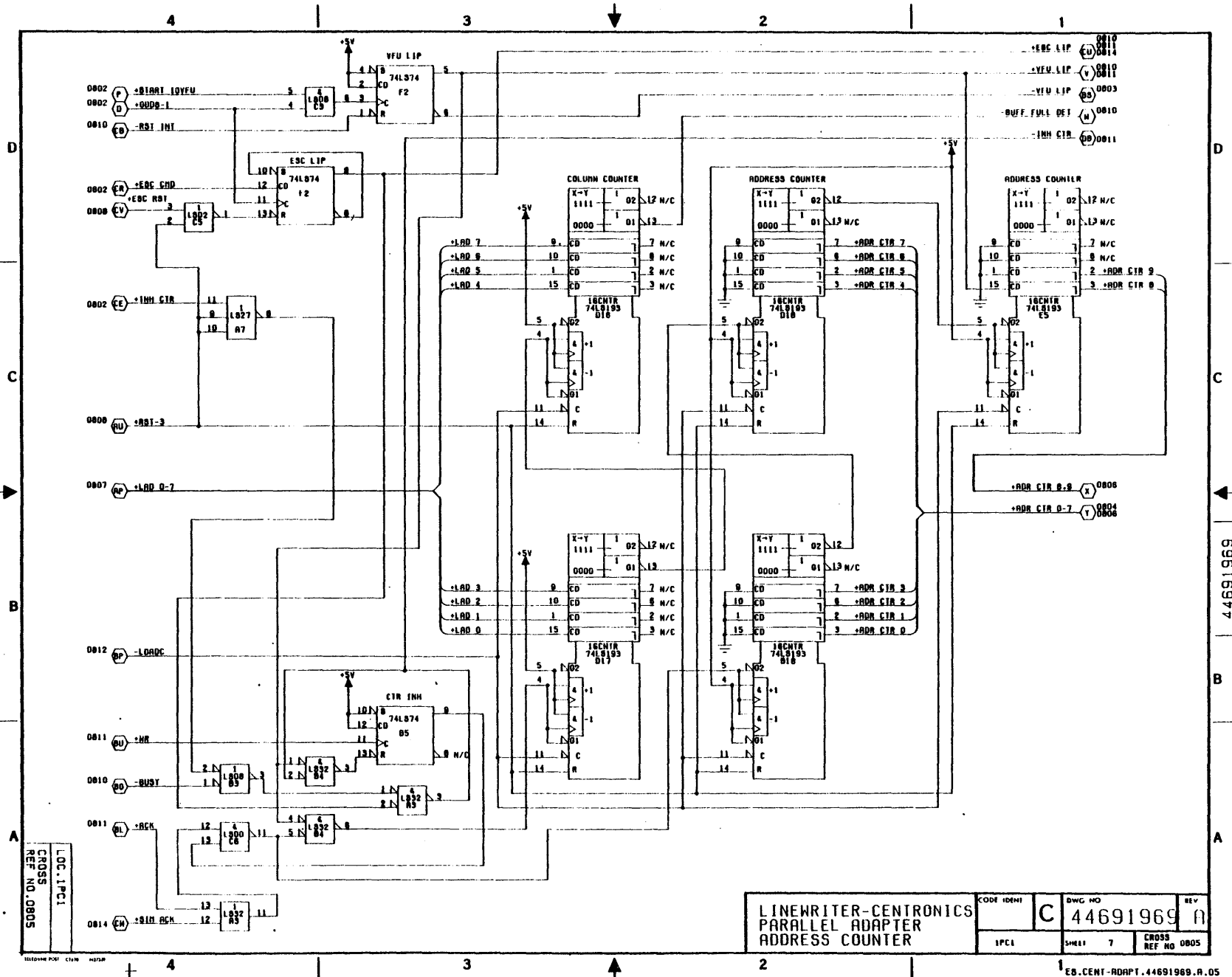
LOC: IFC1
 CROSS REF NO: 0804

MUX SELECT	DATA
0	INPUT DATA (NOT USED)
1	ADDRESS BUS
2	FF SPACE CODE

LINEWRITER-CENTRONICS
 PARALLEL ADAPTER
 DATA MUX

CODE IDENT	C	DWG NO	44691969	REV	A
IFC1		SHEET	6	CROSS REF NO	0804

13-65

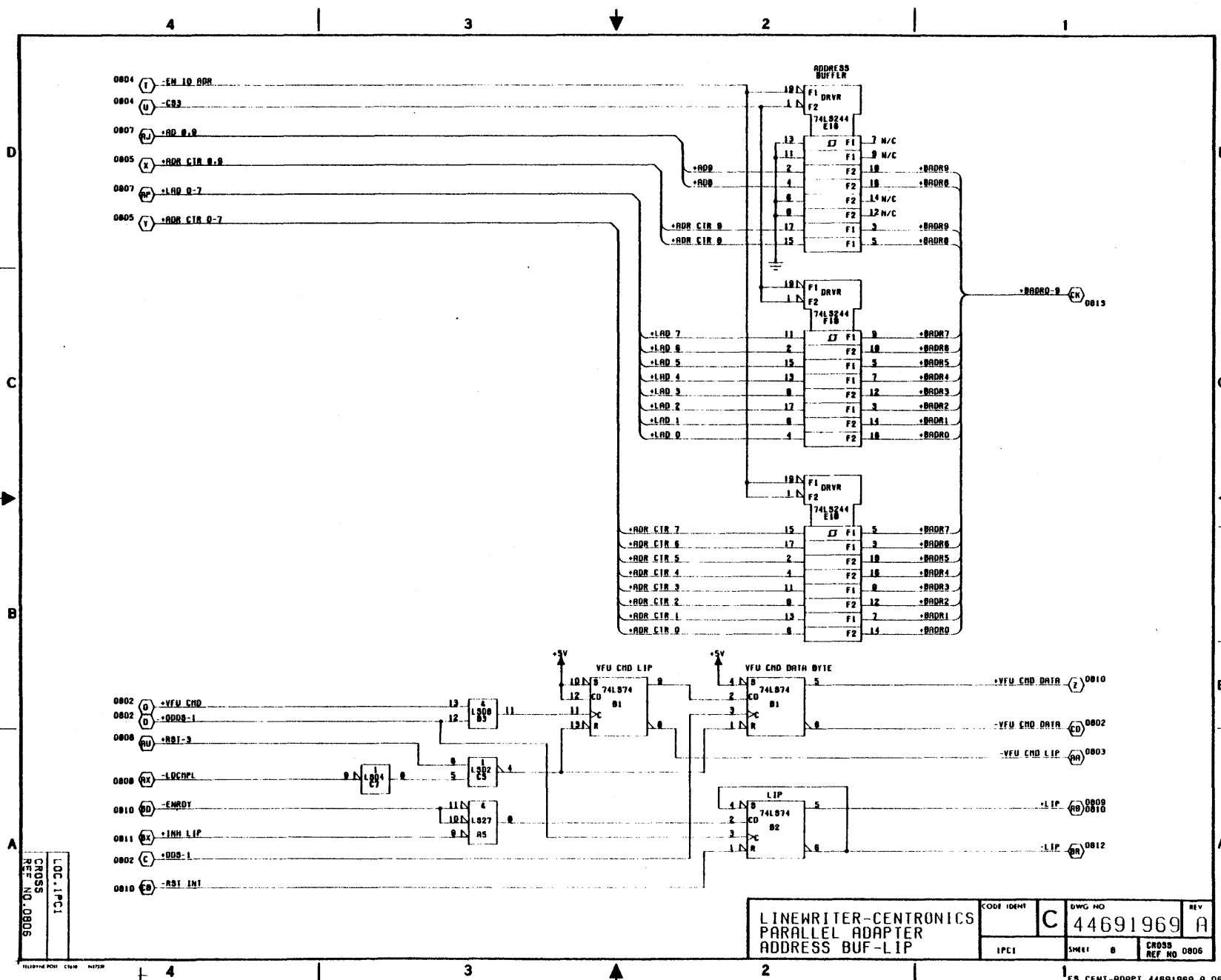


LOC. 1PC1
CROSS REF. NO. 0805

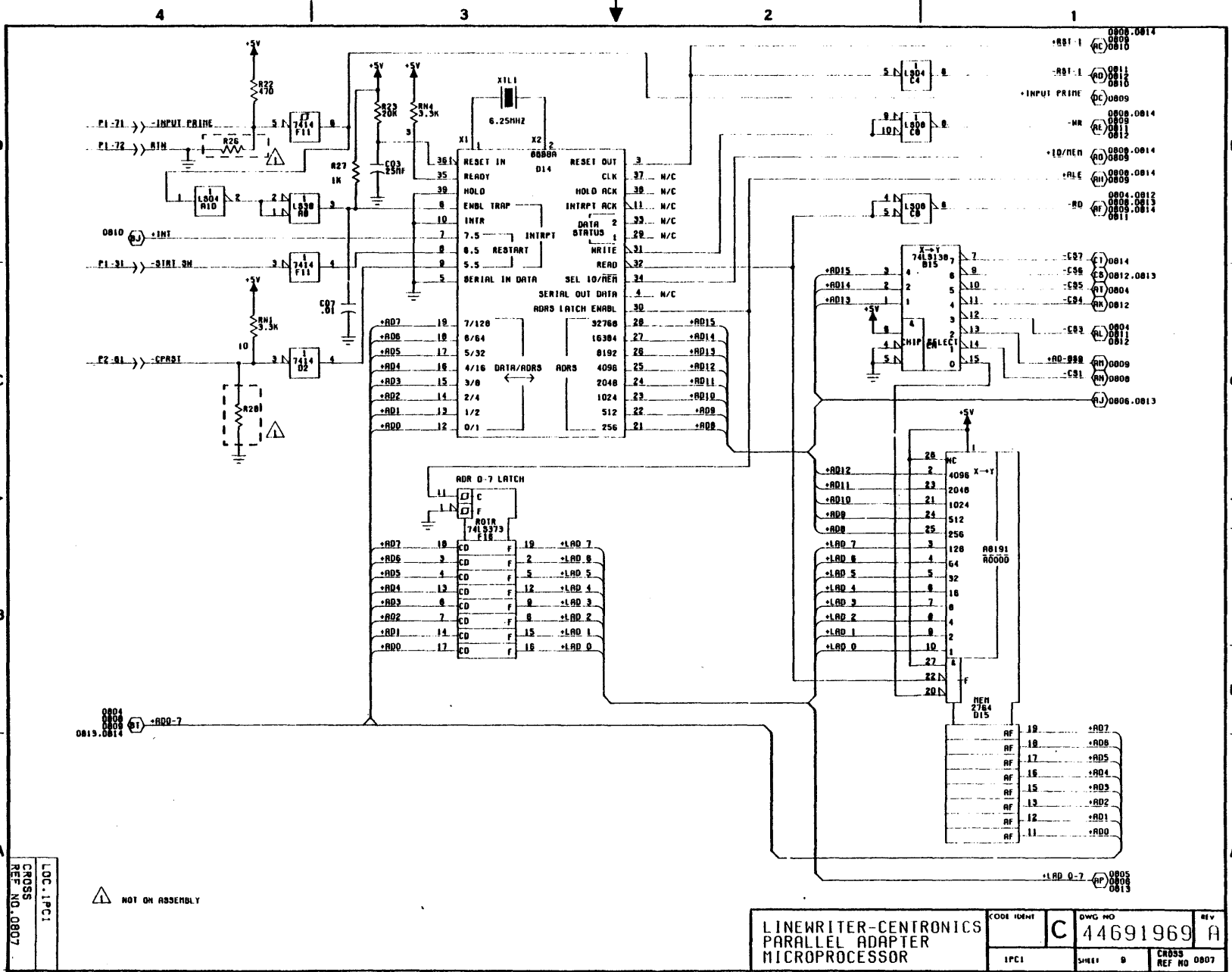
LINewriter-CENTRONICS PARALLEL ADAPTER ADDRESS COUNTER		CODE IDENT	DWG NO C 44691969	REV A
1PC1	SHEET 7	CROSS REF NO 0805		

EB.CENT-ADAPT.44691969.A.05

13-66



13-67



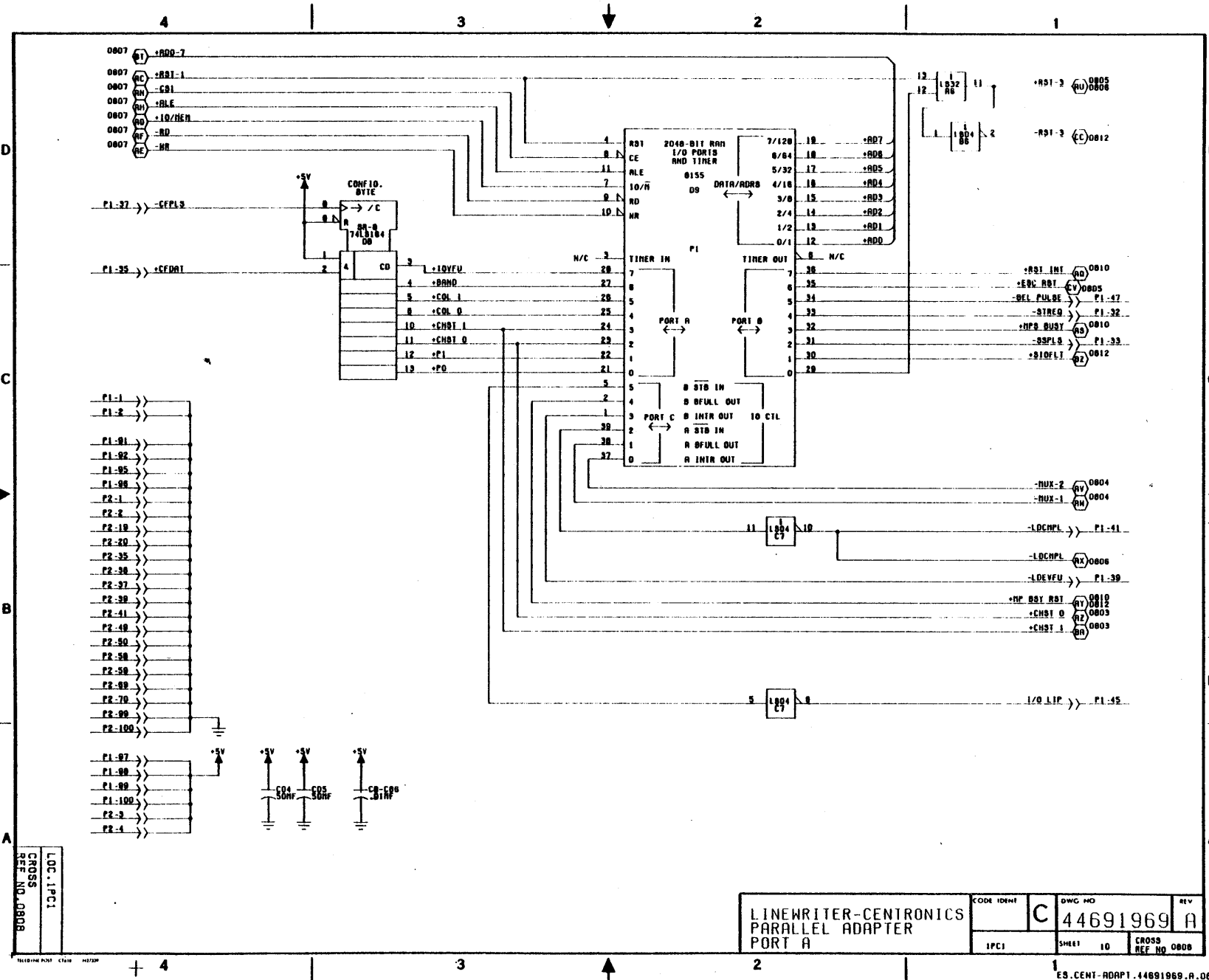
LOC. 1, PCI
CROSS
REF. NO. 0807

NOT ON ASSEMBLY

LINEWRITER-CENTRONICS
PARALLEL ADAPTER
MICROPROCESSOR

CODE IDENT	C	DWG NO	44691969	REV	A
IPC1		SHEET	9	CROSS REF NO	0807

13-68

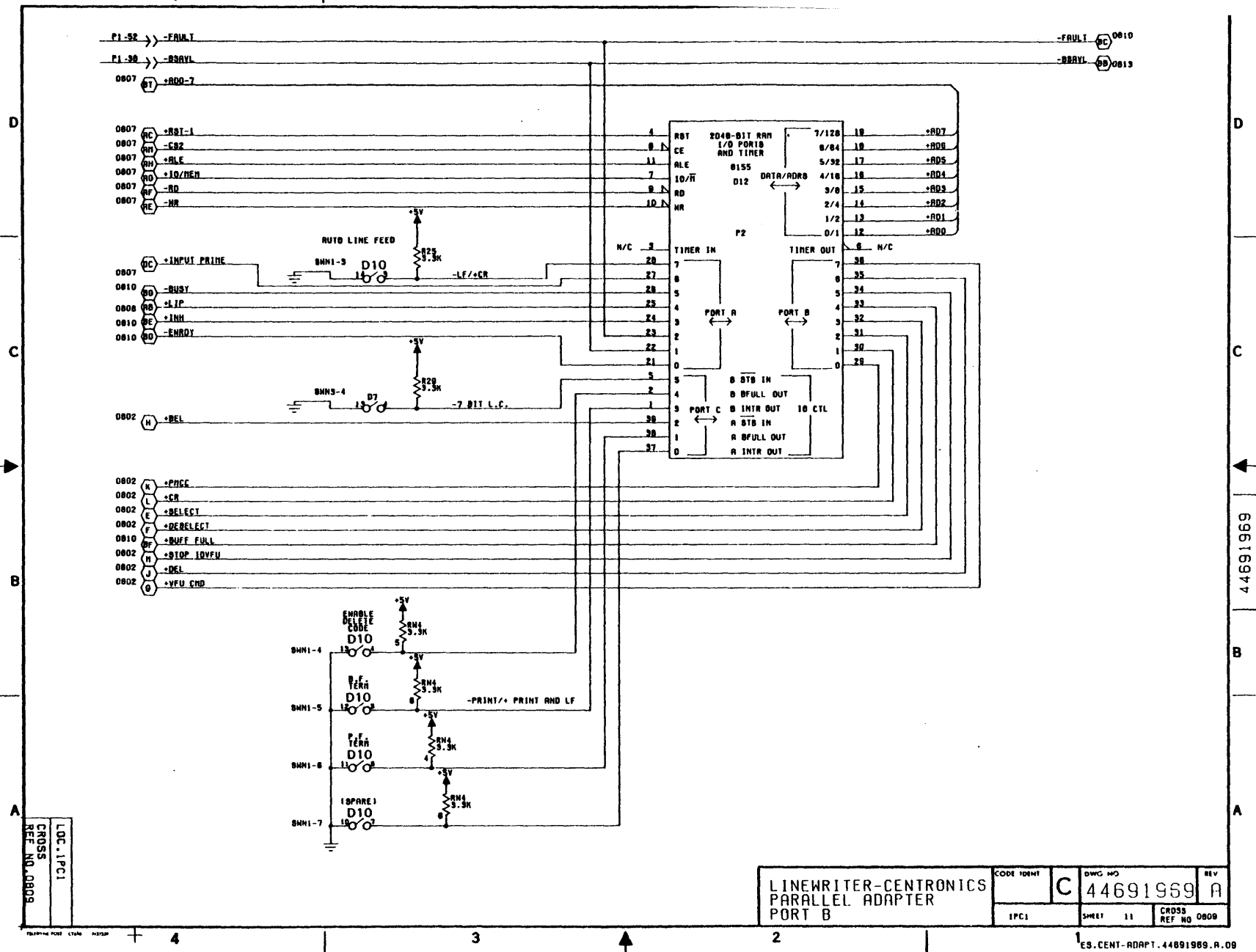


LOC. 1PC1
CROSS
REF. NO. 0808

LINEWRITER-CENTRONICS PARALLEL ADAPTER PORT A		CODE IDENT C	DWG. NO. 44691969	REV A
1PC1	SHEET 10	CROSS REF. NO. 0808		

13-69

JAN., '85



LOC. 1 PCI
 CROSS
 REF. NO. 0809

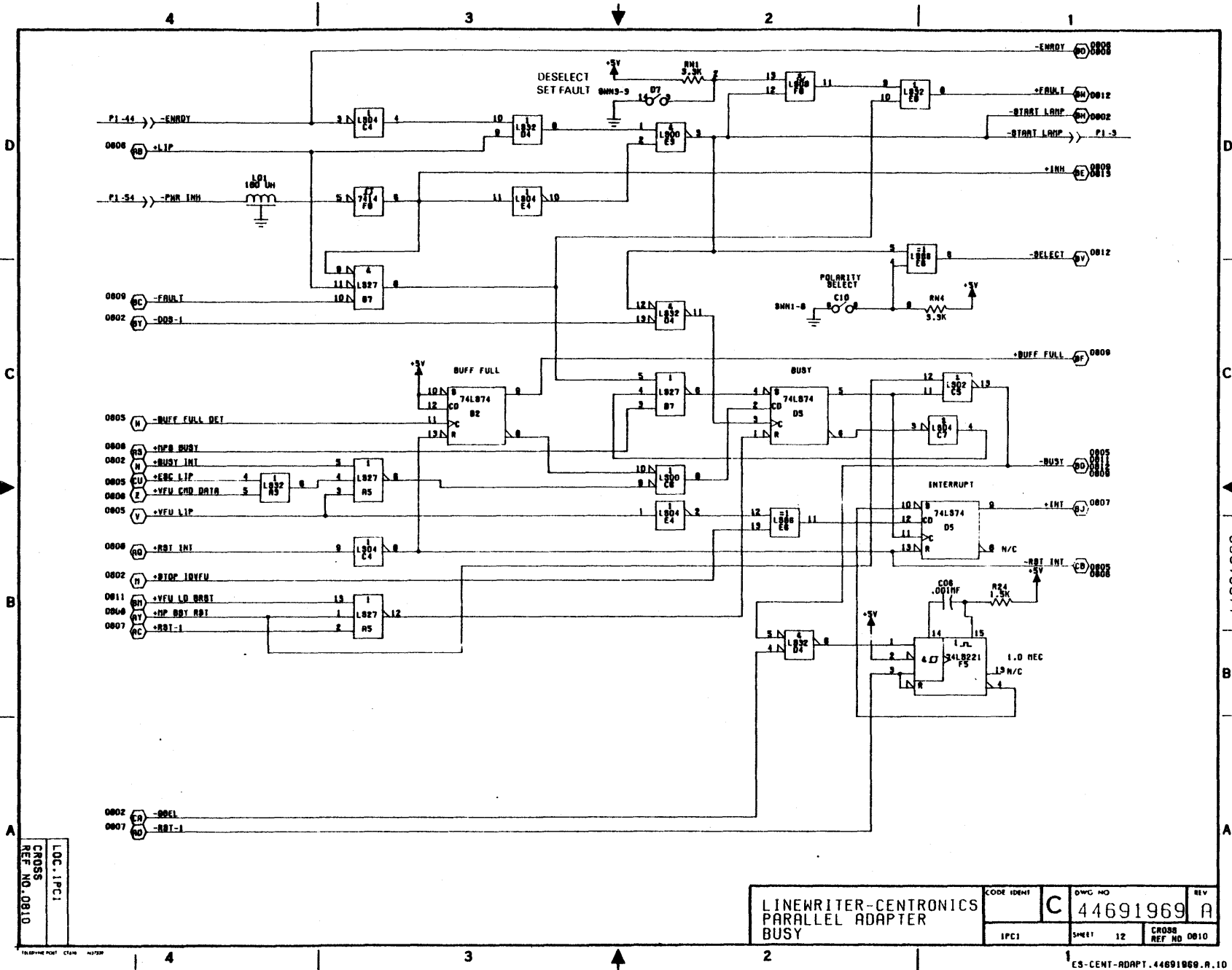
LINewriter-CENTRONICS
 PARALLEL ADAPTER
 PORT B

CODE IDENT	C	DWG NO	44691969	REV	A
IPC1		SHEET	11	CROSS REF NO	0809

ES.CENT-ADAPT.44691969.R.09

13-70

JAN., '85



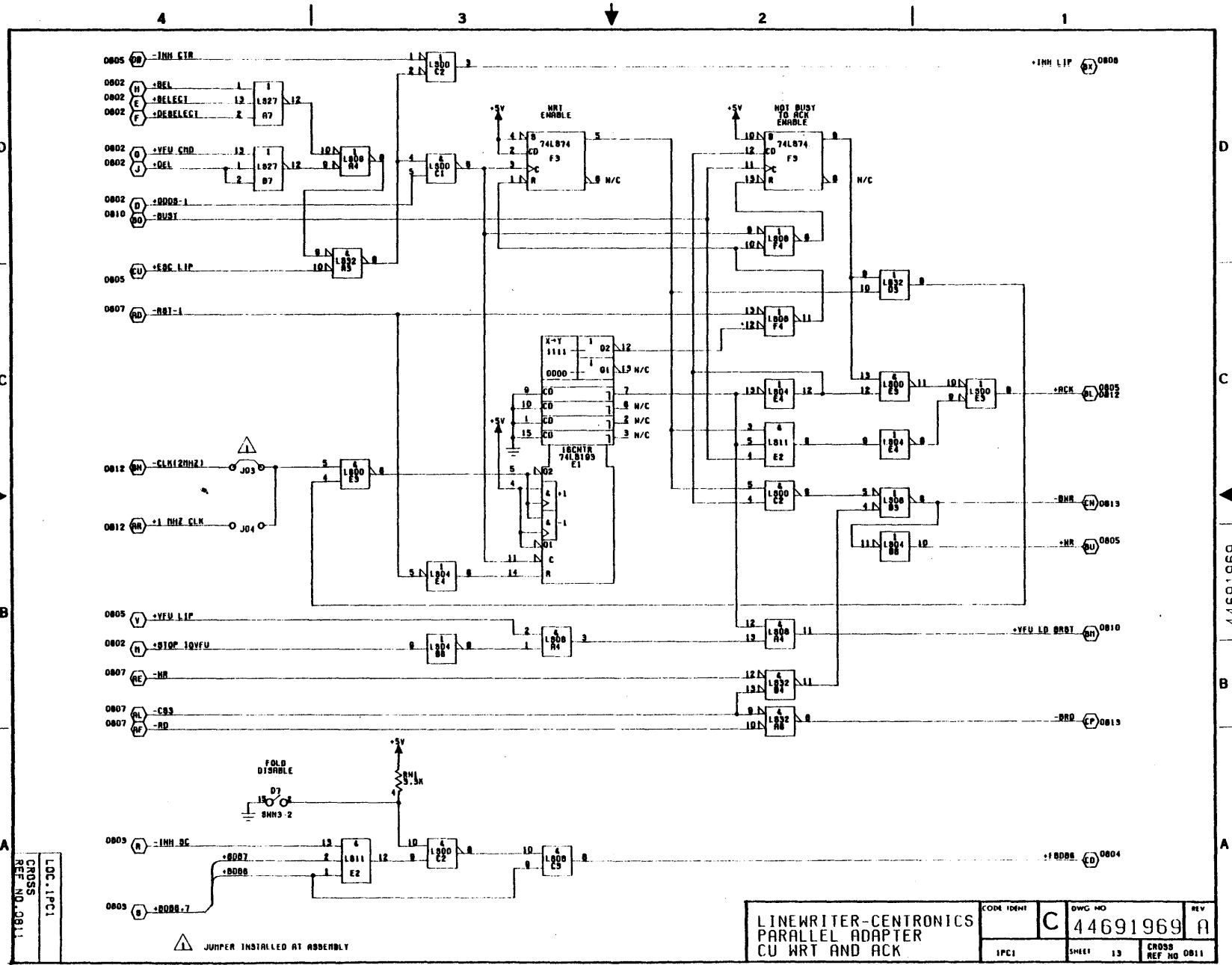
LOC. IPC1
 CROSS
 REF. NO. 0810

LINEWRITER-CENTRONICS
 PARALLEL ADAPTER
 BUSY

CODE IDENT	C	DWG NO	44691969	REV	A
IPC1		SHEET	12	CROSS REF NO	0810

ES-CENT-ADAPT.44691969.R.10

13-71

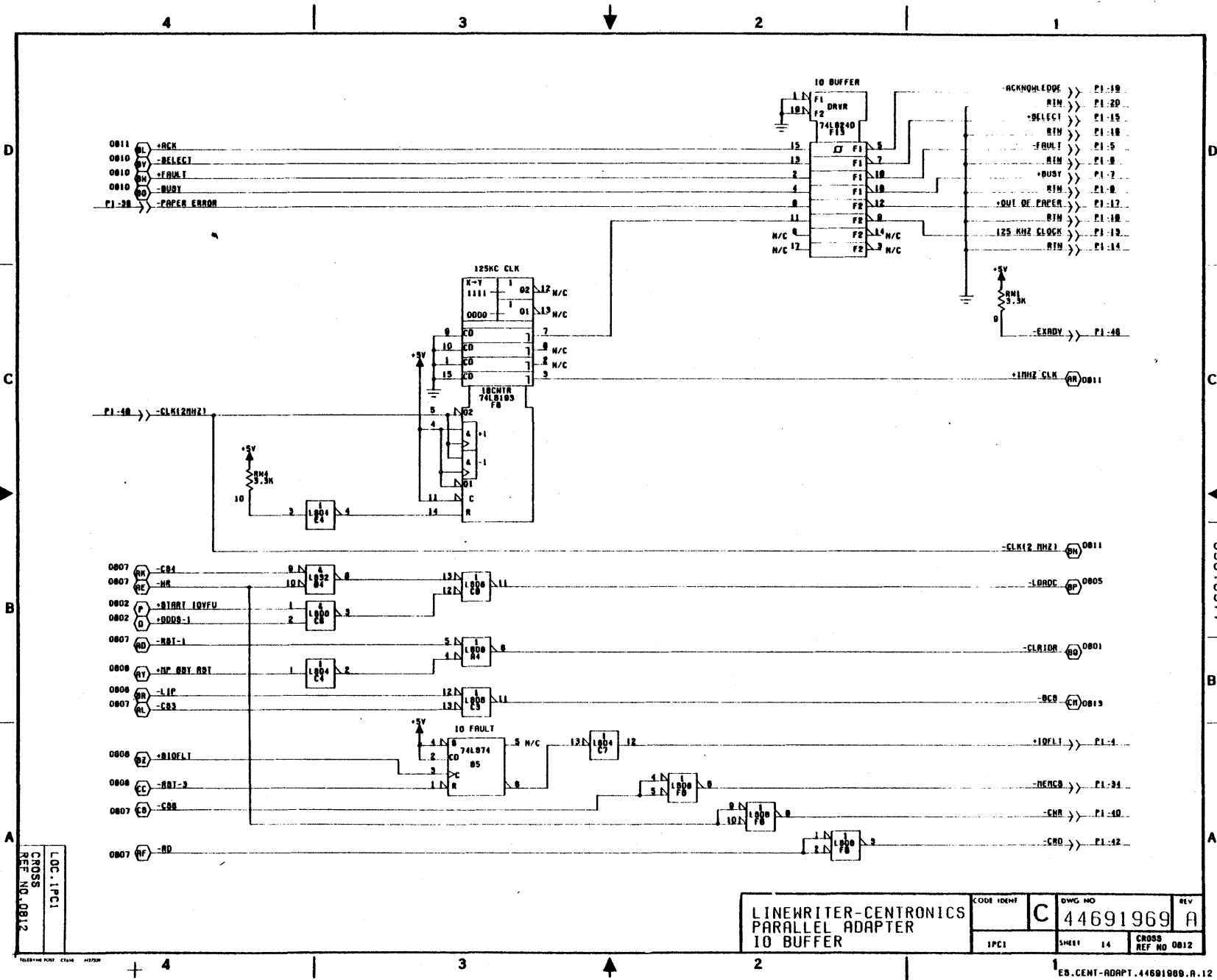


LOC: IPC1
 CROSS
 REF: NO. 0811

LINEWRITER-CENTRONICS
 PARALLEL ADAPTER
 CU WRT AND ACK

CODE IDENT	DWG NO	REV
	C 44691969	A
IPC1	SHEET 13	CROSS REF NO 0811

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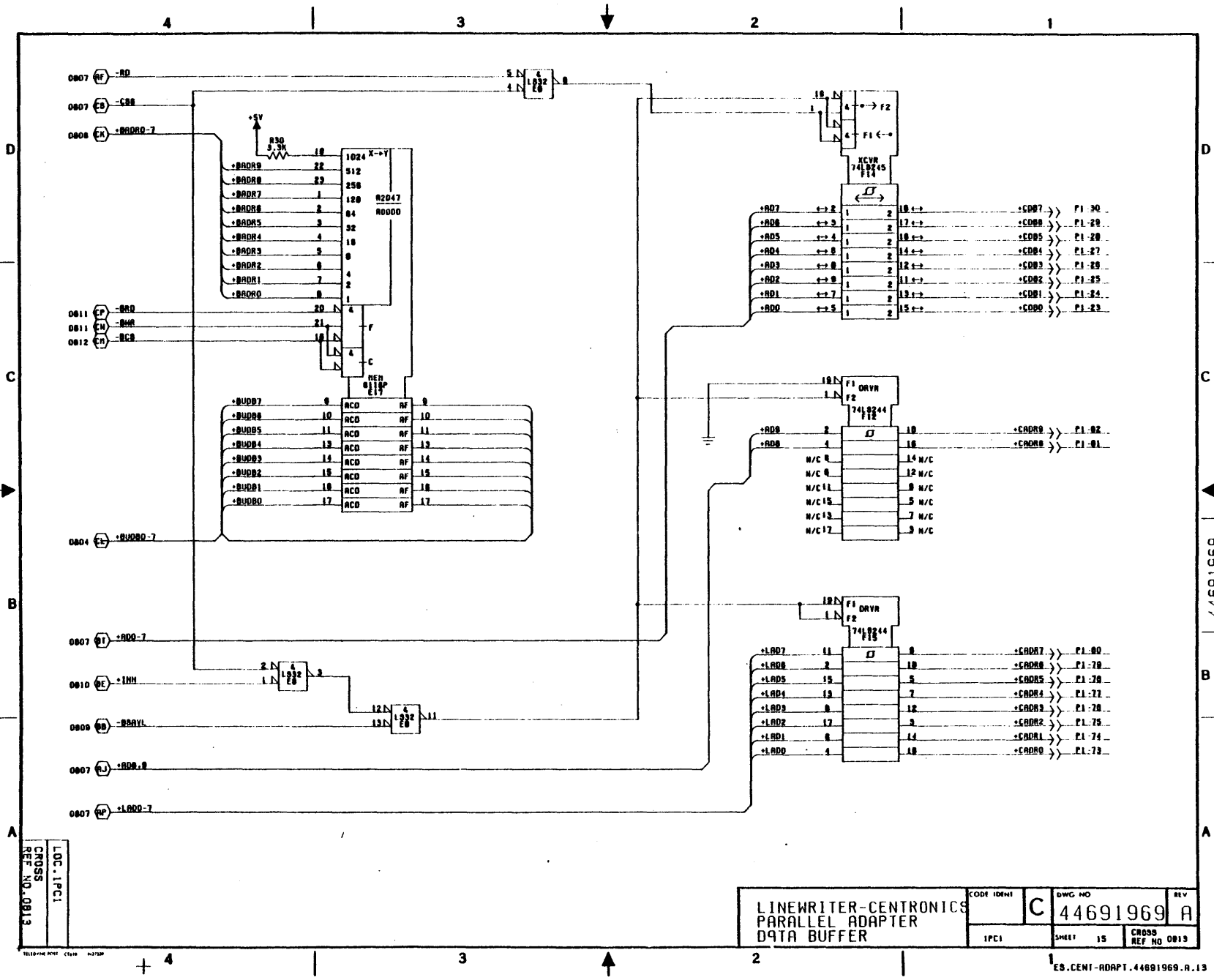
LOC. 1PC1
 CROSS
 REF. NO. 0812

LINEWRITER-CENTRONICS
 PARALLEL ADAPTER
 IO BUFFER

CODE IDENT	C	DWG NO	44691969	REV	A
IPC1		SHEET	14	CROSS REF NO	0812

44691969

13-73

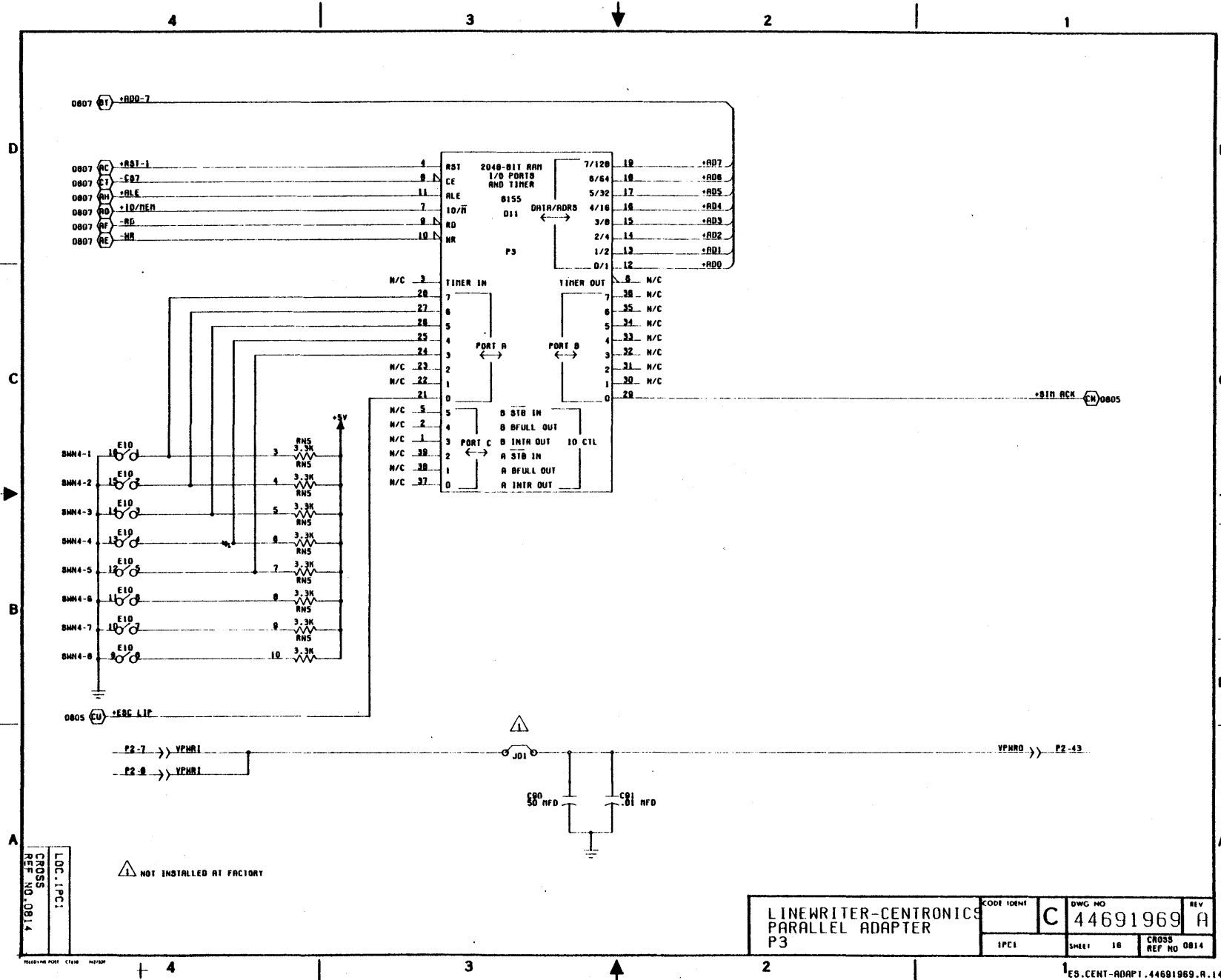


LOC. 1PC1
 CROSS
 REF. NO. 0813

LINEWRITER-CENTRONICS
 PARALLEL ADAPTER
 DATA BUFFER

CODE IDENT	C	DWG NO	44691969	REV	A
IPC1		SHEET	15	CROSS REF. NO	0813

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LOC. 1:PCI
 CROSS REF. NO. 0814

⚠ NOT INSTALLED AT FACTORY

LINEWRITER-CENTRONICS PARALLEL ADAPTER P3		CODE IDENT C	DWG NO 44691969	REV A
IPC1	SHEET 18	CROSS REF. NO 0814		

ES.CENT-ADAPT.44691969.A.14

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